A Stage Matched Physical Activity Intervention In Military Primary Care

by
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Abstract

Title of Dissertation: A Stage Matched Physical Activity Intervention in Military Primary Care

Mary Suzanne Nelson, Doctor of Philosophy, 2000

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Helping individuals increase their physical activity in a population where 85% of US adults essentially are sedentary (US Department of Health and Human Services, 1996) can contribute significantly to achieving the Healthy People 2010 goals (Healthy People 2010, 2000). The purpose of this study was to test a physical activity intervention that would positively impact behavioral mediators, levels of physical activity participation, and cardiovascular indicators in a sample of healthy, military affiliated, primary care patients. There were 96 participants 18-44 years old in this study. Most were enlisted military (56%), Caucasian (54%), females (60%), who had some college education. Measures of motivation, self-efficacy, decisional balance, and stage of physical activity change comprised the behavioral measures, while estimated peak VO_2 and blood pressure were the physiologic measures. Data were collected pre- and post-intervention and again four months after the intervention was completed. Participants were randomized to either the experimental intervention, the Physical Activity Modification Program (PAMP), or to the exercise prescription control group. The PAMP was based upon constructs from the Transtheoretical Model of behavior change.

PAMP participants made no significant improvements in motivation, physical activity self-efficacy and the benefits associated with physical activity from pre- to posttest, although there were positive trends noted. There was no significant decrease in the number of barriers associated with physical activity pre- to posttest, in either group. The groups did not differ significantly in forward movement from one stage of

change to the next but there was positive movement in when both groups were combined. Although not significant, the PAMP group tended to engage in slightly more daily physical activity. The PAMP did not affect cardiovascular health indicators.

Interpretation of data from this study was inconclusive because post hoc power was low. Further investigation is recommended. With Americans averaging 2.7 office visits per person per year to health care providers, and with 60% of these visits occurring in primary care (Patrick et al., 1994), there may be a formidable opportunity to influence the cardiovascular health of many patients before they develop cardiovascular disease.

Dedicated to my best friend and loving husband
Randy Edward Nelson

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Introduction

Physical activity, once a common part of American life, has been systematically engineered out of most occupations and lifestyles. More than 60% of US adults are not regularly physically active and 25% are not active at all (US Department of Health and Human Services, 1996). Inactivity is a significant threat to cardiovascular fitness, and a major contributor to cardiovascular disease (CVD). Although the relative risk for developing CVD from inactivity is not as great as it is for other risk factors, - 1.9 compared to 2.1 for hypertension, 2.4 for high cholesterol and 2.5 for smoking - (Powell, Thompson, Capersen, & Kendrick , 1987), physical inactivity affects a much larger percentage of the population - 60% compared to 10% for hypertension, 10% for high cholesterol, and 18% for smoking (Center for Disease Control, 1991). Low fitness levels are a significant precursor of mortality and are attributed to as many as 250,000 deaths per year in the United States (US Department of Health and Human Services, 1995).

A substantial amount of evidence exists to support the contention that exercise improves health; even modest amounts of physical activity are associated with reductions in morbidity and mortality rates and improvement in both physiological and psychological functioning (Cardinal & Cardinal, 1993). Those who maintain or improve physical fitness are less likely to die prematurely from all causes and from cardiovascular disease than persistently unfit persons are (Blair et al., 1995). Persons at any age can substantially improve their fitness for work and play through appropriate physical activity. There is convincing evidence that blood pressure and heart rate at rest, as well as during submaximal effort are reduced by habitual physical activity, and that body composition, lipids and glucose tolerance is favorably improved (Bouchard,

Shephard, & Stephens, 1994).

Despite the connection between physical activity and cardiovascular fitness, the majority of primary care providers do not incorporate physical activity counseling or recommendations into their daily medical practice. With Americans averaging 2.7 office visits per person per year to health care providers, and with 60% of these visits occurring in primary care, there is a formidable opportunity to influence the cardiovascular fitness of many patients (Patrick et al., 1994). A moderate increase in attention to physical activity in this setting could facilitate widespread positive changes in cardiovascular fitness.

Problem Statement

Of more than 250,000 primary care health providers in the US, including the military, only 15% counsel their patients about physical activity (Patrick et al., 1994). Physical activity counseling is usually offered as tertiary prevention; i.e. prevention directed toward minimizing residual disability from existing diseases and helping the patient learn to live productively with limitation. Counseling healthy patients about increased physical activity and helping them change sedentary habits through effective behavior modification is not usually offered as primary prevention (Pender, 1996). Little is being done to assist relatively healthy patients to incorporate physical activity into their lifestyles prior to the onset of disease or to assist them to maintain physically active lives (Woolf, Jonas & Lawrence, 1996). Physical activity interventions directed at relatively healthy patients for the purpose of improving their cardiovascular fitness are missing from the majority of today's primary care environments. The poor development of physical activity interventions within the primary care setting, to include military primary care settings, can be attributed to problems with intervention design and measurement of the cardiovascular fitness outcomes achieved.

Intervention Difficulties

Problems with planning physical activity interventions arise from several sources. First, it is suspected that many interventions are planned and carried out without reference to any theoretical model, or the intervention is grounded on a model that explains only a small part of physical activity behavior change. This lack of a theoretical foundation for physical activity interventions makes it difficult, if not impossible, to interpret results in a logical manner. Knowledge of an appropriate theoretical model is essential if practitioners are to understand the key elements associated with the initiation and maintenance of physical activity behaviors in their patient population. Essentially, the selected theory should be able to answer questions about why people do or do not engage in physical activity. The theoretical framework is the guide to the development and organization of the intervention; it allows programs to be developed that will reach people and organizations to make an impact on them (Glanz, Lewis, & Rimer, 1997). Physical activity theories should explain behavior and suggest ways to achieve behavior change, and it should lead to the expansion of knowledge by spurring research. Ideally a physical activity theory will lead to accurate predictions of certain empirical events. This means practitioners will be able to predict certain behaviors and then plan interventions accordingly.

Briefly, some of the theoretical models that have been applied to physical activity behavior in the past are the Health Belief Model (HBM), the Health Locus of Control (HLC), the Theory of Reasoned Action (TRA), and the Theory of Planned Behavior (TPB) (Glanz, Lewis & Rimer, 1997). These models, for the most part, were originally developed to predict a single instance of one specific behavior. However, investigators simply are unable to fully capture all of the aspects of physical activity, which is composed of a variety of behaviors carried out repeatedly over a period of time. Helping people to change their physical activity patterns is complex and requires a theoretical

model that addresses the many determinants of physical activity. The Transtheoretical Model (TM), also referred to as the stages of change model, is currently one of the models that is able to do this (Prochaska et al., 1994). The core constructs to be included in the application of the TM are self-efficacy from Bandura's social cognitive theory (SCT)(Bandura A, 1997) decisional balance from Janis and Mann's decision-making model and motivation from Deci and Ryan's self-determination theory (Bandura, 1997; Deci & Ryan, 1985; Janis & Mann, 1977). The TM, unlike others, provides an understanding of the temporal dimension in which physical activity behavior change unfolds and it addresses numerous determinants. This model enables health care providers to match the patients needs rather than expecting patients to match the provider's action oriented interventions.

For anyone, beginning and sustaining a program of physical activity can be difficult. Changing habits of inactivity takes planning and an active, persistent effort. Even with the best of intentions 50% of those who try to exercise regularly quit their routines after only 6 months, negating the health benefits associated with physical activity (Robison & Rogers, 1994). Reasons cited for quitting are loss of motivation, too many barriers, not enough support or time, and a lack of confidence in the ability to succeed (Aarts, Paulussen, & Schaalma, 1997). These are only a few of the determinants or mediators that operate within a person's day-to-day environment to enhance or detract from their performance of physical activity (Pender, 1996). Physical activity interventions need to include these factors in their design. Obstacles need to be broken down one-by-one, and the interventions need to build on the person's self-efficacy. Self- efficacy is the perceived feeling that the individual can do physical activity of some type if he or she sets goals, and if he or she is flexible when daily plans change. Interventions need to appeal to the individual's interests and physical abilities, help the person plan to initiate physical activity and then provide feedback and supports to

maintain physical activity at a consistent level over time within the person's daily life (Nies, Vollman, & Cook, 1998).

A second design difficulty is present in interventions that are: 1) too resource intensive in both time and money, 2) lack clear guidelines thus making implementation difficult, 3) and/or leave follow-up counseling incomplete because practitioners have insufficient knowledge regarding expected outcomes (Calfas, Sallis, Oldenburg, & French, 1997; Patrick et al., 1994). Health care providers, including nurses, must take a more active role in assisting their patients to include physical activity in their personal health programs. Generally, the medical community does not appreciate physical activity as a health measure (Blair & Oberman, 1987). Primary care practitioners are in a key position to: spread the message that moderate physical activity leads to improved cardiovascular fitness, and help individuals become physically active or increase less-than-desirable activity levels (Burns, 1996). One approach to alleviating some of these design problems is to use self-administered interventions that include formal material for the patients and clear guidelines for practitioners, but that do not require large amounts of time and money to implement.

A final design problem stems from controversy surrounding the recommended amount of physical activity necessary to achieve cardiovascular benefits, particularly in the case of moderate-intensity activity (Sallis & Owen, 1999). Many people are under the impression that if they follow the moderate guidelines rather than the more vigorous American College of Sports Medicine (ACSM) guidelines that the quantity of activity does not have to change. This is not true, since by reducing the intensity in the moderate-intensity guidelines, the frequency then needs to increase from 3 days a week to preferably every day. For instance, if the exercise prescription is for jogging for 30 minutes three times a week, at a 10-minute mile, this would amount to about 9 miles a week. At 100 kilocalories (kcal) per mile this is 900 kcals per week of vigorous exercise.

On the other hand, if the prescription is for walking, then the frequency must increase to 5 times a week for 30 minutes at a 15-minute mile rate. The distance is now 10 miles, but the overall energy expenditure is 1,000 kcal. The new moderate guidelines do not mean that vigorous activity is no longer recommended. In contrast, ample evidence still indicates that for many cardiovascular indicators, more benefits accrue from vigorous activity. Thus, it is still the preferred activity recommendation. For individuals who do not engage in regular vigorous activity, it is important to help them meet the moderate intensity guidelines to achieve cardiovascular benefits. To assist patients in achieving better cardiovascular fitness, the design of physical activity interventions in primary care must consider both the intensity and frequency of the activity the person is engaged in.

Measurement Difficulties

Measurement of cardiovascular fitness outcomes is the other major area of weakness with most primary care physical activity interventions. With few exceptions, studies have not focused on cardiovascular fitness outcomes as the dependent variable for determining intervention effectiveness. Many instead simply look at attendance rates at a structured activity (Dishman, 1991). Linkages between the intervention and its ability to improve cardiovascular fitness, (i.e. effectiveness) are poorly reported (Aday, Begley, Lairson, & Slater, 1993). Evidence regarding the effectiveness of physical activity interventions in primary care has many limitations. Most studies are done in very select settings for selected populations evaluating only short-term compliance with exercise recommendations. Generalizability of these findings is largely unknown and little information is available about maintenance after the program has ended (Belisle, Roskies, & Levesque, 1987; Harris, Caspersen, DeFriese, & Estes, 1989). One of the three criteria used by the US Preventive Task Force to evaluate the merit of preventive interventions such as physical activity is effectiveness (Harris et al., 1989). Is the intervention helpful in increasing cardiovascular fitness and/or decreasing the risk of

cardiovascular disease in the setting in which it is being administered? To answer these questions, progress in improving cardiovascular fitness (i.e. changes in resting heart rate, resting blood pressure, estimated peak VO_2 etc.) must be measured.

In addition to direct physiological affects, physical activity interventions also indirectly affect behavior change. An effective intervention will modify one or more of the factors that control behavior, and such changes are expected to lead to improved behavior. It is said that controlling factors "mediate" changes in the behavior. A program that targets mediators of physical activity adoption such as self-efficacy, decisional balance, and motivation should be more effective than programs targeting more generic mediators such as knowledge, normative beliefs, and susceptibility to illness (Sallis & Owen, 1999). The Physical Activity Modification Program is based on mediators' known to increase physical activity behavior and is expected to improve the individual's cardiovascular fitness.

Purpose of Study

The purpose of this study was to assess the effectiveness of a physical activity intervention on selected behavioral and physiological characteristics, and physical activity levels in a sample of healthy military primary care patients under the age of 45.

Research Hypotheses

1) Physical activity behavior changes (confidence, motivation, associated benefits) will be more positive for participants in the Physical Activity Modification Program (PAMP) than among those in the control group at posttest and follow-up.
2) Those in the PAMP will increase their daily physical activity (caloric expenditure, stairs climbed, blocks walked) and reach a higher stage of physical activity behavior change at posttest and follow-up than those in the control group.

3) PAMP subjects will improve their cardiovascular fitness (estimated peak VO_2, blood pressure, resting heart rate) more than subjects in the control group at posttest and follow- up.

Background and Potential Significance

In his classic *Domestic Medicine, or Poor Man's Friend* (1830) John Gunn declared that, "If training were introduced and made use of by physicians in many cases instead of medical drugs, the beneficial consequences in the cure of many diseases would be great indeed." (p.113) Today, the significance of physical activity and its protective effect on the cardiovascular system is widely recognized. Physical activity contributes to cardiovascular fitness through several biological mechanisms; it maintains or increases myocardial oxygen supply, decreases myocardial work and oxygen demand, increases myocardial function and increases the electrical stability of the myocardium (Labarthe, 1998).

The World Health Organization (WHO) is calling for an intensified global campaign to encourage healthy lifestyles and to increase awareness concerning major risk factors such as inadequate physical activity. Three of the six top priorities from WHO include a focus on exercise (World Health Organization, 1997). At the national level, America's vision for improving the health of all of its citizens, *Healthy People 2000,* names physical activity and fitness as one of its 22 priority areas. The Surgeon General in his 1996 report *Physical Activity and Health* asks that we get serious about improving the health of the nation by affirming our commitment to healthy physical activity on all levels: personal, family, community, organizational and national (US Department of Health and Human Services, 1995; US Department of Health and Human Services, 1996). Within the military community of the United States Air Force (USAF), Directive 40-5 mandates that Air Force members must be in good physical condition to support the mission, recognizing that inadequate physical fitness reduces performance, mobility

and endurance (Secretary of the Air Force, 1994). The Air Force currently promotes cardiovascular fitness by making time and programs available for physical training.

The goals of these international, national and military organizations arose from some distressing conditions. In a world population of 5.8 billion (1996), 15 million or 29% of the deaths were due to circulatory diseases, of this 7.2 million deaths occurred due to coronary heart disease. In the US one third of the 2.1 million deaths in 1992 were attributable to heart disease (US Department of Health and Human Services, 1995). More than 10 million Americans are afflicted with clinically significant CVD, including MI, angina, peripheral vascular disease (PVD) and congestive heart failure (CHF) and over 300,000 patients per year are subjected to coronary artery by-pass grafts (CABG) and a similar number to percutaneous transluminal coronary angioplasty (PTCA) (National Institute of Health, 1996). The US Department of Health and Human Services (1996) reports that despite a decline in the age-adjusted death toll from cardiovascular disease, coronary heart disease remains the leading cause of death in the United States.

With 80% of the US population seeing a health care provider during a 1-year period (Woolf et al., 1996), there is a tremendous opportunity for health care providers to alleviate and prevent the overwhelming harm that inactivity is taking on cardiovascular fitness. Efforts are being made to bring physical activity counseling into the primary care setting. One such program is the Provider-based Assessment and Counseling for Exercise (PACE) (Long et al., 1996). The aim of PACE is to develop programs and materials that primary-care providers can use when counseling apparently healthy adults about adoption and maintenance of regular physical activity. Two other programs using exercise counseling are the 5 A's (address the agenda, assess, advise, assist, assess again), a counseling strategy developed by the Smoking, Tobacco and Cancer Program(Pinto, Goldstein, & Marcus, 1998b), and the Activity Counseling Trial (ACT) (Blair et al., 1998).

All of these programs rely primarily on physicians for assessing physical activity levels and for the delivery and follow up of brief physical activity counseling. There are approximately 250,000 primary care nurses who could support physical activity interventions applied in primary care yet they do not play a role in these interventions (Dishman & Buckworth, 1996). As health professionals, nurses, by virtue of their positions have always had permission to intervene in people's lives to eliminate disease and distress. This should include interventions that encourage individuals to live healthier lives and improve their cardiovascular fitness (Blue, 1997).

The Physical Activity Modification Program (PAMP) involves nurses and medical technicians in assessing physical activity habits and capabilities, implementing a stage matched physical activity program, prescribing structured physical activity as warranted, monitoring responses to physical activity and following up on physical activity behavior (American Heart Association, 1996). The intention of this study is to introduce a physical activity intervention that will help in the achievement of the physical activity and fitness objectives of Healthy People 2000. A conceptual model of PAMP is provided in Figure 1. Patients receive either the stage-matched intervention (PAMP) or an exercise prescription. As a result of the intervention it is anticipated that patients will take positive actions that lead to increased physical activity. The increase in physical activity is expected to have positive physiological outcomes, which will lead to improved cardiovascular fitness.

Theoretical Framework Providing Rationale for Study

The TM (Prochaska et al, 1994) emerged from a comparative analysis of 18 leading theories of psychotherapy and behavior change over the past 15 years. Early pertinence of this model was found with smoking cessation and treatment of drug and alcohol addiction (Riebe & Nigg, 1998). The Transtheoretical Model encompasses both behavior and behavioral intention (Marcus & Simkin, 1994); it takes into account the

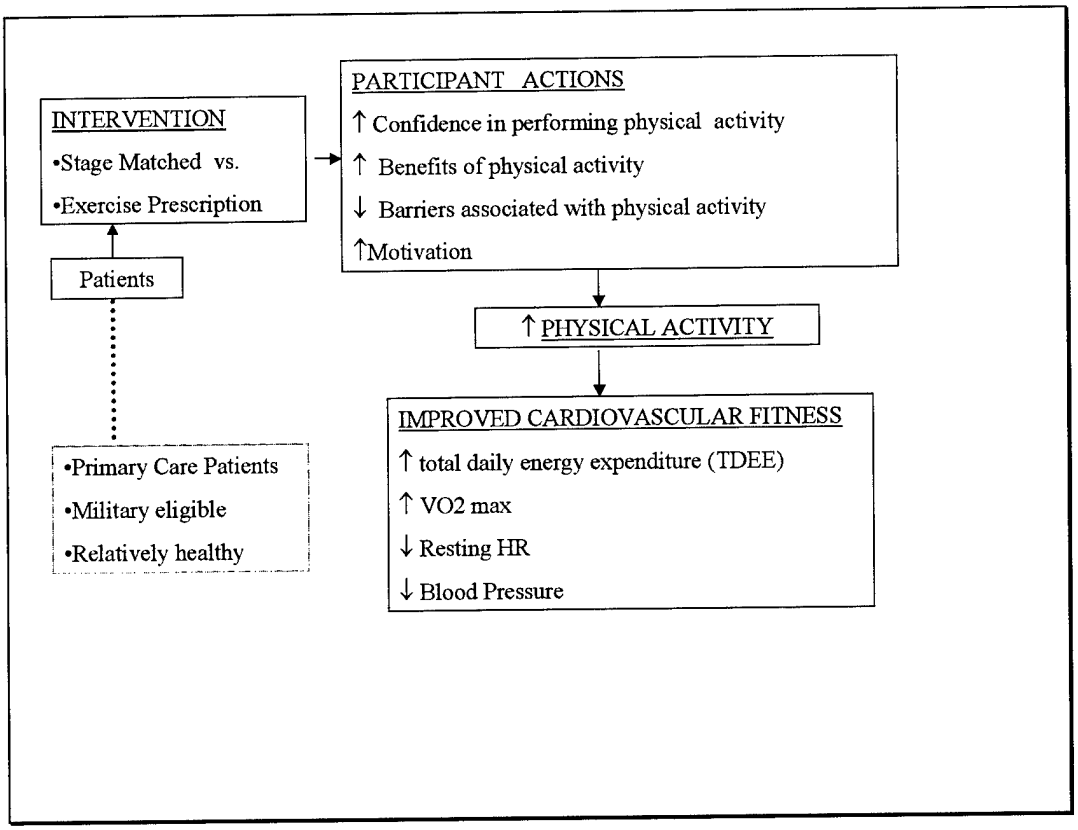


Figure 1. Conceptual Model of Physical Activity Modification Program

individual's readiness to change, and it charts a course for that change. The Transtheoretical Model has four constructs, these are: stages of change, decisional balance, self-efficacy and processes of change (Prochaska, Redding & Evers, 1997). Within the framework of the TM, behavior change is seen as a process rather than an event. Because individuals have different levels of motivation, or readiness to change, they require different interventions. Most physical activity interventions do not recognize these individual differences and are action-oriented, focusing on immediate change. As (Prochaska, Redding, & Evers, 1997) succinctly stated, "We need to be concerned about the national rush to research representative samples of entire populations with action-oriented interventions, since the majority of people with health behavior problems are not likely to be ready to take action to change their behavior. We need to study better ways to match our interventions to where the population is 'at,' and, we need to

have our expectations for change match the realities of change, so that success with brief, inexpensive interventions can include helping people progress to more permanent changes in their lifestyle."

The TM uses the stages of change, a temporal dimension, to integrate processes and principles of change from different theories of intervention. Highly related to the stages and processes of change is the individuals' evaluation of the benefits and costs of changing their physical activity behavior, the degree of confidence they have in themselves that they can engage in physical activity, and their capacity to act out of choice rather than obligation or coercion (Deci & Ryan, 1985). The TM stages of change are an excellent framework for physical activity interventions (Deci & Ryan, 1985; Reed, Velicer, Prochaska, Rossi, & Marcus, 1997; Sallis & Owen, 1999). The stages of change represent specific constellations of attitudes, intentions, and behaviors related to an individual's status in the cycle of change (Prochaska & Norcross, 1994). Each stage reflects not only a period of time but also a set of tasks required for movement to the next stage. The time an individual spends in each stage may vary but the tasks to be accomplished are invariant. There are five stages of change, precontemplation, contemplation, preparation, action, and maintenance (Prochaska & Norcross, 1994). The strength of the TM is its ability to explain the different transitions in adoption and maintenance of physical activity behavior. Individuals previously categorized as sedentary can now be differentiated by three stages (physical activity precontemplation, contemplation, and preparation). (Costakis, Dunnagan, and Haynes, 1999)

Individuals in physical activity precontemplation do not engage in regular structured physical activity, and they have no intention of changing their behavior in the next six months. They may be unaware of the negative consequences of their behavior or they may have become discouraged due to failure in previous change attempts, or for some other reason. Physical activity contemplators are aware that a problem exists with

sedentary behavior and they are seriously thinking about overcoming it, but they have not yet made a commitment to physical activity action. They do not engage in regular structured physical activity, but intend to begin within the next 6 months; these people are not yet prepared to take action; rather they are evaluating their options. Those in the next stage, physical activity preparation, intend to take action immediately to change sedentary habits and they may report some small behavioral changes; those in physical activity preparation do not engage in structured physical activity regularly, but intend to begin in the next 30 days (Potvin, Gauvin, & Nguyen, 1997). In the physical activity action stage, individuals have modified their sedentary behavior, experiences, and/or environment to overcome their problems; they engage in structured physical activity on a regular basis, but have done so for less than 6 months. The fifth stage is physical activity maintenance. People in physical activity maintenance work to prevent relapse and consolidate gains attained; they have been engaging in structured physical activity regularly for more than 6 months (Prochaska & Norcross, 1994).

There are ten processes of change closely associated with the stages of change. These processes are the cognitive, affective, and behavioral strategies people use as they progress through the different stages of change over time. They are the covert or overt activities that individuals use to modify their experiences and/or environments in order to modify their sedentary behavior (Marcus & Simkin, 1994). In the early stages of change people apply cognitive, affective and evaluative processes to progress through the stages while in later stages people rely on commitments, conditioning, contingencies and environmental controls (Prochasks, Norcross & DiClemente, 1994). The intervention in this study is anchored in these processes. A brief description of the ten processes is provided in Table 1 (Marcus, Rossi, Selby, Niaura, & Abrams, 1992b). The

Table 1

Definitions of Processes of Change for Physical Activity

Process	Definition
1. Consciousness Raising	Efforts made by the individual to seek new information and to gain understanding and feedback about physical activity
2. Countering	Substitution of alternative behaviors for sedentary behavior
3. Emotional Arousal	Affective aspects of change, often involving intense emotional experiences related to loss of cardiovascular fitness due to inactivity
4. Environmental Control	Consideration and assessment by the individual of how being sedentary affects the physical and social environment
5. Helping Relationships	Trusting, accepting, and utilizing the support of caring others during attempts to change inactive habits
6. Contingency Management	Changing the contingencies that control or maintain physical activity
7. Commitment	The individual's choice and commitment to change sedentary behavior, including the belief that one can change
8. Self-Reevaluation	Emotional and cognitive reappraisal of values by the individual with respect to physical activity
9. Social Liberation	Awareness, availability and acceptance by the individual of alternative, active life-styles in society
10. Stimulus Control	Control of situations and other causes which trigger inactivity

processes can be organized in a hierarchical manner representing two constructs: cognitive and behavioral. Theoretically, these processes are derived from a variety of therapy systems including behavioral, cognitive, existential, experiential, gestalt, humanistic, interpersonal, psychodynamic, and radical therapies. Research has demonstrated that an integration of stages and processes of change can provide a useful guide for intervention (Marcus & Simkin, 1994). Although extensive research confirming the use of particular change processes at each of the stages of change has been conducted with other health behaviors, the processes used at each physical activity stage are not as well documented.

For this study the constructs of decisional balance, self-efficacy and motivation are used in conjunction with the stages of change in terms of both intervention content and outcomes. Decisional balance reflects the individual's relative weighing of the benefits and barriers of changing sedentary behavior. To progress from physical activity precontemplation to physical activity contemplation, the benefits of changing (e.g. more energy, look better) must increase. To progress from physical activity contemplation to physical activity action, the barriers of changing (e.g. lack of time, uncomfortable) must decrease. Therefore, with people in physical activity precontemplation, the benefits for intervention are targeted and the barriers are saved until they progress to physical activity contemplation. Having the benefits high enough and the barriers low enough is part of the physical activity preparation for progress to physical activity maintenance without relapsing (Prochaska et al., 1997).

The construct of self-efficacy, the belief that one can successfully perform a desired behavior, also plays an important part in each stage of change. The relationship between self-efficacy expectations and physical activity is both reliable and substantial, despite diverse samples and measurement instruments. Stronger self-efficacy beliefs are associated with higher goal setting, firmer commitment to goals, more successful

anticipatory scenarios, more appropriate behavior selection, greater perseverance, more effort expended to perform the behavior, use of helpful thought patterns, facilitative emotional reactions to behavior, and lower likelihood of being dissuaded by difficulties. People with higher physical activity self-efficacy expectations maintain a sense of energy during exercise, perceive less effort being expended during exercise, report more positive affect during and after exercise, and report feeling more revitalized (Conn, 1998).

Physical activity self-efficacy can determine whether an individual attempts an activity; the degree of persistence extended when difficulties are encountered, and ultimate success. Bandura, 1977, distinguishes four methods of enhancing self-efficacy. These are performance attainment, vicarious experience, verbal persuasion and physiologic state. Performance attainment attempts to break complex skills down into easily mastered sub-skills that provide successful experiences. Once convinced they have what it takes to succeed, individuals can persevere in the face of adversity and rebound from setbacks. Success builds self-efficacy while failure undermines it. The second self-efficacy enhancement technique is vicarious experience. In essence this is a modeling approach. Seeing another person, similar to them, engaged in the desired behavior is diagnostic of their own capabilities. Verbal persuasion is a third way to increase self-efficacy. Talking to the people and giving them a pep talk bolsters self-change and encourages the person to mobilize greater effort. Finally physiologic state teaches people to read their physiological signs as positive verses distressing. This is especially relevant in domains that involve physical accomplishments like physical activity where increased heart rate and perspiration are actually positive rather than negative signs.

Attempts to increase exercise behavior are influenced by self-judgments of the expected benefits from regular physical activity, and perceived abilities to be physically

active regularly. The strongest correlate with physical activity behavior among adults was self-efficacy, expressed as the confidence in the ability to be physically active in specific situations (Sallis et al., 1989). As people progress through the stages of change, they move from low levels of physical activity self-efficacy to higher levels of physical activity self-efficacy. The relationship of self-efficacy to physical activity is through reciprocal determinism. As a person increases his or her confidence in being able to engage in physical activity, he or she will be more active and as activity increases he or she will gain more confidence in being able to stay active. Increased confidence will improve adherence to the new behavior.

In a study using self-efficacy theory to examine stages of exercise behavior subjects who had not yet begun to be physically active, had little confidence in their ability to be physically active in contrast with those who engaged in regular physical activity (Marcus, 1992b). Individuals at all stages of physical activity behavior can benefit from interventions that differ in their focus on enhancing efficacy expectations (Mince, 1994). Significant correlations were found in studies linking high levels of physical activity self-efficacy with actual performance of physically active behaviors. Self-efficacy has been associated with physical activity of healthy individuals in supervised and free-living settings, and a significant predictor of adoption and maintenance of physical activity (King, 1992).

This study focused on perceived physical activity self-efficacy. It was not concerned with whether subjects could master the skills of the activity but whether they had the self-regulatory efficacy to mobilize themselves to be physically active on a regular basis in the face of a variety of personal, social, and situational impediments. Success in regular physical activity is heavily dependent on self-regulatory efficacy (Bandura, 1997).

Within the schema of this study self-efficacy refers to the individuals perceived

physical activity self-efficacy or their judgment that they are able to organize and execute physical activity behavior under various conditions. It is not a measure of outcome expectations or judgments of the likely consequences of physical activity behavior (Bandura, 1997).

Motivation a construct from self-determination theory is a basic human need and as such individuals will be optimally and intrinsically motivated when they perceive themselves to be the "origin," or to be in control of their own behavior. They are physically active because they enjoy it, it revitalizes them, and it helps relieve stress (Biddle, 1995). For example, if in the process of improving some aspect of cardiovascular fitness people begin to regard themselves as physically active so that physical activity becomes an essential part of their identity, the chance of continuing the physical activity is much higher then if the motivation is external. If the motivation is external through coercion by others to be physically active, then the chances of continuing the activity are lower (Biddle, 1995). Extrinsic motives may lead to tension, pressure to perform and feelings of compulsion, whereas intrinsic motives allow freedom from pressure and experience of choice (Markland & Hardy, 1997). According to the TM, it is essential to design interventions that raise intrinsic motivation toward physical activity if the behavior is to be maintained. Motivation actually may drop in the physical activity maintenance stage and precede a relapse into sedentary habits. As physical activity is resumed, motivation again will be increased. In this case activity precedes motivation.

The application of the Transtheoretical Model to physical activity is important because this model takes into account both actual physical activity habits and intentions regarding future physical activity behavior. Given that many individuals participate in little or no physical activity and that there is increased risk of morbidity and mortality associated with a sedentary lifestyle, it is important to understand the characteristics of

those in the early stages of change. Such information may lead to an understanding of the initiation and early adoption of physical activity and may be used to inform the development of physical activity interventions (Booth & Tseng, 1997).

A diagram of the schema used for this study is provided in Figure 2. Four of the constructs from the TM (stages of change, decisional balance, self-efficacy, and processes of change) are represented in the model as well as the construct of motivation. The shaded arrows represent the relative contribution that each construct makes at the different stages of change. Each stage of physical activity change

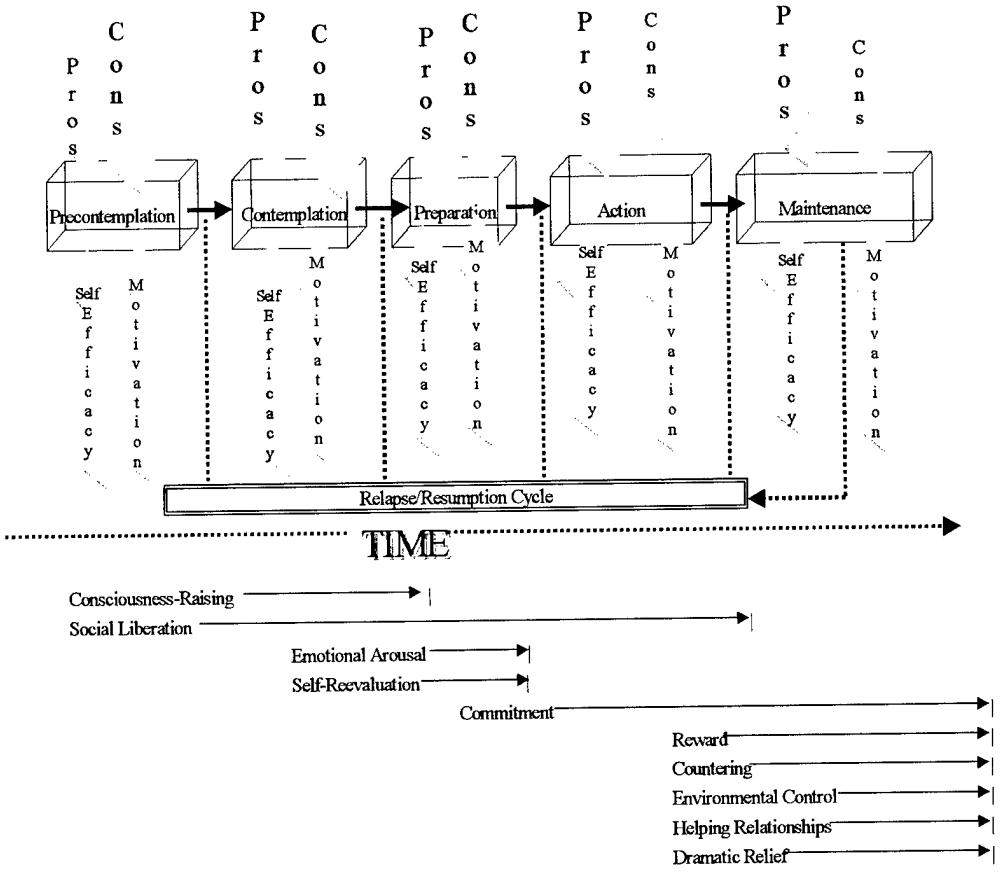


Figure 2. Theoretical Schema Adapted from Prochaska, 1994

represents a temporal dimension that takes place in a period of time and entails a series of tasks that need to be completed before progressing to the next stage. Each stage

does not inevitably lead to the next and in fact relapse and resumption can occur at any stage. It is possible to become stuck at one stage or another or to even relapse to a previous stage (Prochaska, Norcross & DiClemente, 1994).

Decisional balance in this schema is represented as Janis and Mann's (1977) pros and cons. As an individual moves through the stages of change the gains for self, pros, increase while the costs to self, cons, decrease. Physical activity self-efficacy, which is composed of two parts, confidence, the belief the person has that they can cope with situations that would keep them from being physically active, and temptation, the intensity of the urge to engage in physical activity when in a difficult situation, increases as the individual moves through the stages of change. Motivation or the intrinsic and extrinsic desire to be physically active is incorporated into the TM because of its importance to physical activity behavior adoption. As a person progresses from one stage of change to the next motivation increases. The last construct, processes of change, provide the guiding framework for the PAMP intervention used in this study. The processes are like independent variables that people need to apply as they move from stage to stage.. Understanding the contributions of these constructs can fill in some of the existing theoretical gaps in physical activity behavior.

Clinically this schema can be used to effectively help individuals maintain or increase their levels of physical activity by targeting those areas appropriate to the stage of change the person is in. For example if an individual were in the preparation stage the health care provider would want to focus on the processes of emotional arousal, self-reevaluation and commitment as well as helping the person to decrease the barriers and to reinforce the benefits associated with physical activity.

Demographic Determinants of Physical Activity

In general younger, better-educated, more affluent, white adults and males report higher levels of exercise and/or physical activity than do other demographic cohorts

(Caspersen, 1995). Gender differences occur with activity intensity. Men are usually more representative of those who participate in intense activity while females participate in more low-moderate activities. Differences in physical activity levels by age group can be represented by a bimodal curve with physical activity levels higher in adolescence then tapering off in the twenties and picking back up again as people reach there thirties, forties, and fifties. Race as determinant of activity levels is often confounded by socioeconomic status and education level (US Dept. Health and Human Services, 1995). African Americans and Mexican Americans tend to be less active than their white counterparts. Studies of other ethnicities are scarce. With regard to occupation and income the most consistent findings show that blue-collar workers are more likely to be less physically active than white-collar workers (Oldridge, 1984). There is remarkable consistency in finding that level of education is positively associated with physical activity especially leisure time activity. On its own education may not be a predictor of physical activity but in combination with other factors it is highly predictive. Smoking and obesity are two other factors that are thought to interfere with physical activity levels. Those who smoke and/or are overweight are less likely to be physically active (Dishman, 1994).

Assumptions

1) Physical activity is a demanding, often quite complex behavior with poor adherence rates (Dishman, 1994c).
2) Physical activity behavior change occurs in ordered stages (Laitakari, 1998)
3) Success in a previous stage helps the individual move to subsequent stages.
4) No single theory can account for all of the complexities of behavior change. Therefore a more comprehensive model will most likely emerge from integration across major theories (Shumaker, Schron, Ockene, & McBee, 1998).
5) Written material received by participants is read.

Delimitations

Participants were volunteers and may not have represented the more general military primary care population.

Limitations

1. Incomplete or poor return of self-report data from 7-Day Physical Activity Recall Records.
2. Four month time period of the intervention may have been too short to observe behavioral or physiological changes (Bassett and Howley, 2000).
3. Data interpretation was difficult as a result of dropouts. Inadequate sample size affected the power of the study.
4. Lack of a strict control group to compare the intervention group to.
5. Seasonal variations in physical activity levels that may have confounded study findings.
6. Participant's inability to recall and record physical activity levels accurately.
7. Within group variability that may have affected the power of the study.

Definition of Terms

1. Activity Barriers: any environmental or personal event that interferes with performing physical activity also cons (Pender, 1996).
2. Activity Benefits: the promotion or enhancement of well-being through physical activity, also pros in the TM.
3. Behavioral Mediator: one of three constructs associated with each of the stages of change in the TM i.e. decisional balance (pros & cons), self-efficacy, and motivation.
4. Cardiovascular Fitness: the beneficial physiological changes affecting the cardiovascular system (i.e., lower resting heart rate, improved cardiac output, improved maximal oxygen consumption, lower blood pressure, improved lipid

profile, and others), that occur from aerobic physical activity. Cardiovascular fitness is associated with the prevention of coronary heart disease (Braun, 1991).

5. Motivation: the direction and intensity of one's effort due to intrinsic or extrinsic forces (Weinberg & Gould, 1995).
6. Peak VO_2: the highest rate of oxygen transport and use that can be achieved at maximal exertion (American College of Sports Medicine, 1998). In the United States Air Force the bicycle ergometry test is used to estimate estimated peak VO_2
7. Physical Activity: bodily movement produced by skeletal muscles that requires energy expenditure and produces healthy benefits (US Department of Health and Human Services, 1996).
8. Physical activity modification program (PAMP): the stage matched behavior modification intervention used in this study.
9. Physical Activity Self-efficacy: a person's confidence in his or her ability to do specific physical activities in specific circumstances (Sallis & Owen, 1999).
10. Processes of Change: strategies people use to make changes (Bandura, 1977; Sallis & Owen, 1999).
11. Resting Heart Rate: the heart rate at rest, averaging 60 to 80 beats per minute (US Department of Health and Human Services, 1996).
12. Self-determination: the quality of human functioning that involves the experience of choice; action that occurs out of choice rather than obligation or coercion (Deci & Ryan, 1985).
13. Stages of Change: steps through which people progress as they make changes (Marcus & Simkin, 1993). For this study stages of change means physical activity stages of change. There are five:

a. Precontemplation: individuals in physical activity precontemplation do not engage in regular structured physical activity, and they have no intention of changing their behavior in the next six months(Prochaska & Norcross, 1994) .

b. Contemplation: individuals in physical activity contemplation are aware that a problem exists with sedentary behavior and they are seriously thinking about overcoming it, but they have not yet made a commitment to physical activity action. They do not engage in regular structured physical activity, but intend to begin within the next 6 months (Prochaska & Norcross, 1994).

c. Preparation: these individuals intend to take action immediately to change sedentary habits and they may report some small behavioral changes; those in physical activity preparation do not engage in structured physical activity regularly, but intend to begin in the next 30 days (Potvin, Gauvin, & Nguyen, 1997).

d. Action: individuals have modified their sedentary behavior, experiences, and/or environment to overcome their problems; they engage in structured physical activity on a regular basis, but have done so for less than 6 months. (Prochaska & Norcross, 1994).

e. Maintenance: People in physical activity maintenance work to prevent relapse and consolidate gains attained; they have been engaging in structured physical activity regularly for more than 6 months (Prochaska & Norcross, 1994).

14. Transtheoretical Model: a behavioral model developed by Prochaska and DiClemente that uses the stages of change, a temporal dimension, to integrate processes and principles of change from different theories to assist people to change unwanted behaviors or to adopt new behaviors (Glanz, et al, 1997).

Summary

This study provides a platform for a physical activity intervention in the primary care setting based on the Transtheoretical Model. An intervention that can assist primary care patients to increase their levels of physical activity while at the same time not increasing the workload on clinic staff is a positive step toward achieving a portion of our national health objectives. Due to the serious public health effects of physically inactive lifestyles, it is worth expending intellectual and monetary resources to understand the forces that affect physical activity behavior. Carefully controlled studies that include the factors that influence the adoption of greater physical activity will contribute to the development of interventions that are more effective in improving cardiovascular fitness (Sallis & Owen, 1999).

Chapter II

Review of Literature

Introduction

The purpose of this chapter is to review literature relevant to the implementation of a theoretically sound and effective physical activity intervention within a primary care setting. The first section of the review will focus on studies employing the transtheoretical model as it applies to physical activity behavior. Section two is a summary of physical activity intervention research and outcomes with a focus on studies conducted in primary care settings. The final part of the review will be a synopsis of the current literature pertaining to recommended physical activity levels for the effective improvement of cardiovascular fitness.

The Transtheoretical Model and Physical Activity Behavior

In the area of physical activity, research has demonstrated that the different stages of change for physical activity are correlated with distinct attitude, decisional balance and self-efficacy patterns (Potvin et al., 1997). Interest in applying the TTM to the study of physical activity has accelerated in recent years. To date, a number of cross-sectional studies, one longitudinal study, and one or two intervention studies have been conducted (Dishman, 1994a).

Sonstroem in (Cardinal, 1993) was the first Physical/Health Educator to acknowledge and empirically extrapolate the Transtheoretical Model's stage system to increased physical activity acquisition. He not only sought to demonstrate the existence of stages in acquiring a physical activity habit, but also the ability of belief statements to predict placement within these stages (Murphy, 1992). This early research tested the applicability of the TM to the study of physical activity behavior among 220 males between the ages of 26 and 67 years (Dishman, 1994a). The findings found plausibility

in applying the TM to the study of physical activity initiation and maintenance. A second investigation was conducted by Barke and Nicholas in (Dishman, 1994a) who measured stages of change in a group of 59 older adults aged 59 to 80, comparing the stages between active and inactive groups. The findings of this study demonstrated that the stages of change scale could effectively distinguish groups of older adults who differ in level of physical activity.

Marcus & Simkin, 1993 continued the examination of the TM to physical activity by differentiating 235 employees from two worksites, retail and manufacturing, into stages of change for physical activity. Univariate tests revealed a significant between group effect for total minutes of vigorous activity in the past week, $F(2, 218)=20.57$, $p < .001$. Tukey tests for post hoc comparisons of means revealed that subjects in Action/Maintenance reported significantly more minutes of vigorous activity than subjects in Preparation and Precontemplation/Contemplation. The difference between Preparation and Precontemplation/Contemplation was also significant. The proportion of variance accounted for (η^2) was .16, indicating a large effect size. The univariate effect for total minutes of moderate physical activity was also significant, $F(2, 218)=9.09$, $p < .001$. In this analysis, subjects in Action/Maintenance reported significantly more moderate activity than those in Precontemplation/Contemplation. The proportion of variance accounted for by moderate activity was .08, indicating a medium effect size. The stages of change model significantly differentiated employees among the stages.

In a cross-sectional study, (Marcus & Owen, 1992) tested whether 1,093 subjects from the United States and 801 subjects from Australia differed in terms of physical activity self-efficacy, perceived pros and cons of physical activity, and prevalence across the stages of physical activity adoption. The findings from this study supported the stages of change model significantly differentiating between most stages of change in a manner consistent with theory. There also appeared to be a general pattern of increased

self-efficacy and perceived benefits for physical activity across the stages of change (i.e. maintenance greater than action, which is greater than preparation etc.). These authors recommend intervention studies that seek to increase these constructs within specific populations.

Marcus et al in (Cardinal, 1993) used the TM to design an intervention for 610 community volunteers between the ages of 18-82. This study demonstrated that following a six-week stage matched intervention, most subjects increased their stage of exercise adoption. Thirty percent of those in the Contemplation stage at baseline and over 60% of those in the Preparation stage at baseline were in the action stage at the end of the six weeks. Furthermore, another 30% of baseline Contemplators had progressed to the Preparation Stage. These results suggest that continued development of stage matched interventions for physical activity adoption and maintenance is warranted.

Cardinal & Sachs, 1995 conducted an analysis of stage-of-exercise movement following mail-delivered, self-instructional physical activity packets with a sample of 113 female clerical workers employed at a university. This intervention supported progression through the stages of change posited by the TTM of behavior change. If future research corroborates this conclusion, practitioners would have a potentially powerful and relatively inexpensive intervention tool, especially for those not ready to take action.

Cardinal, 1997 also conducted a study to determine the degree of association among stage of exercise and body mass index, cardiorespiratory fitness, exercise behavior, relapse, barriers, and self-efficacy. This was a descriptive, cross-sectional study of 235 adult, volunteers with a M age of 34.7 years. Significant between-stage differences were found for the overall set of dependent variables ($p < .0001$) and for each dependent variable separately ($p < .01$). The proportion of variance accounted for

by the dependent variables ranged from .06 to .53. Limitations of this study were the cross-sectional design, indirect measure of VO_2 max, self-selection, and concurrent assessment of stage of exercise and fitness, which may have led to altered responses on the stage questionnaire. Results of this study do extend the current literature supporting the construct validity of the stages of exercise model. Physical activity interventions may ultimately be enhanced by first identifying an individuals stage of exercise.

Using "stages of behavioral change" constructs to measure the short-term effects of a worksite-based intervention to increase moderate physical activity (Cole, Leonard, Hammond, & Fridinger, 1998) evaluated a three-level incentive program to promote regular, moderate physical activity among employees working in a federal agency. The objective was to assess the short-term effects of the intervention by examining the stages people go through as they attempt to make permanent changes in physical activity. Indicators of the process by which changes in physical activity take place were based on a modified version of the TM. A one-group pretest/ posttest design was used to ascertain which of the stages the 1,192 participants were in both before and after the intervention. Analysis indicated that, of the 1,192 participants, 6.5% regressed one or more stages, 30.3% did not regress or progress from one stage to another, 27.7% remained in the maintenance stage, and 35.4% progressed one (21.1%) or more (14.3%) stages during the 50-day intervention. These findings reinforce the notion that the stages of change concept can serve as indicators of the change process which in turn, can be used as evidence of the short-term effectiveness of interventions. Findings also indicate this type of intervention holds promise for increasing physical activity among willing participants of a worksite population.

A study by (Armstrong, Sallis, Hovell, & Hofstetter, 1993) examined the relationship between stages of change, self-efficacy, and the adoption of vigorous

exercise among 6,000 randomly chosen subjects from San Diego, California. A major finding of this study was that baseline stage of change was not only a significant predictor of future exercise but was a predictor of approximately equal magnitude with self-efficacy. This is important because out of the wide variety of determinants of physical activity, self-efficacy has been found to be the strongest correlate and predictor of physical activity participation. In terms of stages, contemplators reported that during the first 6 months post-baseline (6 months exercise) they regularly exercised vigorously during more months than precontemplators, $t(399) = 5.84$, $p < .001$, $r^2 = .07$. Of the first 6 months postbaseline, contemplators reported an average of 2.19 months (SD = 2.64) of regular vigorous exercise, whereas precontemplators averaged .89 months (SD = 1.77). Contemplators had higher baseline self-efficacy scores than did precontemplators, $t(399) = 5.09$, $p < .001$, $r^2 = .07$. On the 5-point scale, contemplators had an average self-efficacy score of 3.09 (SD = 1.35), whereas precontemplators averaged 2.48 (SD = .96). These analyses add to the growing body of evidence supporting the use of TM for understanding physical activity adoption and maintenance.

Changing physical activity behavior is not easy. The TM of behavior suggests that people fall into different stages of change based on their readiness and willingness to adopt and maintain a physically active life. Some people are very motivated to change while others are not even thinking about it, therefore when health care providers try to intervene to change physical activity behavior it is counterproductive to offer one blanket intervention for everyone. It is better to tailor the program. Matching the person to their stage of change is much more likely to be successful (Riebe & Nigg, 1998). The potential major contributions of TM for increasing and maintaining physical activity lie in its consideration of the readiness of individuals for change and its capacity for helping health professionals tailor the use of different cognitive-behavioral and environmental strategies to individuals and groups (King, 1992). The stages of change model provides

a sound framework for understanding the dynamic nature of physical activity behavior change Marcus et al in (Cardinal, 1993).

Physical Activity Intervention Research

A wide variety of interventions to promote physical activity with individuals and groups have been evaluated. Dishman, 1994b reviewed the characteristics and results of 56 studies on interventions to increase exercise and physical activity published between 1988 and 1994. Most of these studies used randomized or quasi-experimental designs with large samples of males and females of varying ages. The interventions generally lasted from 6 weeks to 5 years and the outcome measures varied. Some of these measures were: self reported activity, health evaluations and screenings, resting heart rate, basal metabolic index, 7-day recall, estimated peak VO_2, METS (metabolic energy cost), observation, and attendance. The literature from these studies permits the following conclusions. 1) Health education and behavior modification or cognitive-behavior modification principles can be implemented with physical activity programs and are accompanied by increased frequency of activity or time spent in activity for limited periods of time (e.g., 4 to 20 weeks). 2) Physical activity intensity or total activity was not increased enough to reliability increase physical fitness or to reduce risk for future morbidity or mortality. 3) The quasi-experimental nature of about one half of the literature limits confident conclusions about the cause and effect nature of increased physical activity that has accompanied interventions. 4) Most studies have used indirect measures of physical activity or indirect measures of physical fitness based on heart rate or treadmill time; thus their validity is uncertain. Only a few studies have attempted to verify self-reports of activity. 5) Effect sizes for increased fitness when VO_2 max was measured is typically small, even when the effects for self-reported activity are large. 6) Most interventions have not been based on a broader theoretical model of behavior change such as TM and have not considered activity history and the companion

literature on the determinants of physical activity (National Institute of Health, 1995).

Dishman & Buckworth, 1996 published a meta-analytic review of 127 intervention studies. Criteria for inclusion in the study were: 1) The dependent variable was a measure of physical activity consistent with consensus definitions used in public health or a measure of physical fitness that is a surrogate of physical activity. 2) The independent variable was an intervention designed to increase habitual physical activity. 3) Outcomes of the interventions were quantified and could be compared with a variance estimate of the outcome from a control group or condition in the absence of the intervention. 4) An effect size could be expressed as a Pearson correlation coefficient, r, permitting effects to be calculated from studies that used diverse statistical presentations including frequencies, percentages, graphs, *t*-tests, and chi-square- and *F*-tests with a single *df*, when means and standard deviations were not reported.

More than 130,000 subjects in community, worksite, school, home, and health care settings participated in the studies reviewed. Physical activity measures used were self-report, attendance or observation, physiologic surrogates (spirometry, time on treadmill, resting heart rate, etc.), and muscular strength. The mean effect of the interventions was moderately large, $r = 0.34$, approximating three-fourths of a standard deviation or an increase in binomial success rate from 50% to 67%. The estimated population effect weighted by sample size was larger, $r = 0.75$, approximating 2 standard deviations or increased success to 88%. Some of the main findings of the meta-analysis are presented in Table 2. The analysis of effects weighted by sample size suggests that interventions based on the principles of behavior modification, delivered to healthy people in a community, are associated with large effects, particularly when the interventions are delivered to groups using mediated approaches or when the physical activity is unsupervised, emphasizing leisure physical activity of low intensity, regardless of the duration or frequency of participation. The maintenance of successful physical

Table 2.

Effect Sizes for Selected Physical Activity Intervention Characteristics (Sallis & Owen, 1999)

Intervention Characteristics	Effect Size[a]
Intervention type	
Behavior modification	.92
Cognitive behavior modification	.10
Health education/risk appraisal	.10
Physical education curriculum	.21
Intervention delivery	
Face-to-face programs	.16
Mediated interventions	.91
Face-to-face + mediated	.10
Activity goal Increasing activity during leisure time	.85
Specific aerobic prescription	.18
Strength training	.46
Unsupervised activity	.78
Low- to moderate-intensity activity	.94
General community settings	.82

a. .10 small effect size; .30 medium effect; .50 large effect

activity after the conclusion of an intervention has been less encouraging, implying a need for sustained or repeated implementation of controlled trials to confirm the effectiveness of interventions.

Dunn et al., 1998 conducted a six-month physical activity trial, Project Active, to compare a lifestyle physical activity program with a structured exercise program in

changing physical activity (total energy expenditure [$kcal \bullet kg^{-1} \bullet d^{-1}$]) and cardiorespiratory fitness (estimated peak VO_2 in $ml \bullet kg^{-1} \bullet min^{-1}$). A major difference of the lifestyle intervention from structured exercise is the emphasis on the behavioral skill building rather than exercise prescription of bouts of exercise, and urging the integration of a wide variety of moderate intensity activities accumulated over the course of the day. Two hundred thirty-five sedentary but healthy adults between the ages of 35-60 years received six months of intensive intervention. The major finding was that after 6 months of intervention the lifestyle physical activity intervention was as effective in increasing physical activity as the structured exercise intervention. Also, those in the lifestyle group significantly increased their cardiorespiratory fitness from baseline. Limitations of this study were a lack of no contact control and the select group of volunteers from the community. Despite these limitations, the results of this study demonstrate that a lifestyle intervention that incorporates established behavior change principles and a flexible approach to promotion of activity is effective for increasing physical activity and fitness in sedentary adults over the short-term. It is important to test these interventions in other populations and to match treatments to individuals to enhance success.

There have been few physical activity intervention studies carried out within the primary care setting and none that have been implemented by nursing staff. Only a few studies have addressed whether physicians discuss exercise practices with patients. When providing counseling the focus is on high risk patients. Patients are not typically given an exercise prescription although detailed algorithms for exercise prescriptions have been reported in the literature.

One study by (Calfas et al., 1996) tested the effectiveness of brief physician-based counseling to increase physical activity in sedentary patients in a nonrandomized-controlled trial. The program, Physician-based Assessment and Counseling for Exercise

(PACE), was designed to overcome several barriers to physician counseling regarding physical activity that had been discovered in a pilot study carried out in diverse clinical settings. The aim of PACE was to develop programs and materials primary-care providers could use when counseling apparently healthy adults about adoption and maintenance of regular physical activity. Stages of change theory are the basis for this program. General findings show physicians to have positive attitudes regarding the importance of a number of prevention-oriented behaviors, however their practice patterns do not reflect this (Marcus et al., 1992a). The PACE intervention was also designed to increase physical activity self-efficacy, reduce perceived barriers to activity and increase awareness of the benefits of physical activity.

Apparently healthy, sedentary, adult patients (N = 255) were recruited from 17 physician offices for PACE; mean age was 39 years. Intervention physicians delivered 3 to 5 minutes of structured physical activity counseling during a well visit or follow-up for a chronic condition. A health educator made a brief booster phone call to patient's 2 weeks after the counseling. Self-reported physical activity and stage of change were collected at baseline and at 4- to 6- week follow-up. A subsample received objective activity monitoring. Patients who received the intervention reported increased walking more than control patients (+37 min/week vs. +7 min/week). Participants also demonstrated a greater increase in readiness to adopt activity than control subjects. This research was able to show that physician-based counseling for physical activity is efficacious in producing short-term increases in moderate physical activity among previously sedentary patients. Categorizing patient readiness to adopt physical activity was also found to help physicians tailor their counseling to better meet the patients needs.

Limitations of this study that should be addressed in future studies include its focus on subjects in the contemplation stage excluding those in the precontemplative or active stages. Providers should be able to provide effective counseling to promote

physical activity for all stages. More work needs to be done to optimize the efficacy of preventive counseling by evaluating different roles for physicians. As integral members of the health care team nurses are ideally suited to provide counseling. Follow-up time should also be extended. The intervention for this proposed study will be modeled, in large part, on the PACE materials, Living with Exercise, with some modifications.

Calfas et al., 1997 also evaluated the construct validity of the physical activity intervention discussed above by testing whether the intervention changed hypothesized mediators and whether changes in the mediators were associated with behavior change. Hypothesized mediators were processes of change, self-efficacy, and social support for exercise. Findings indicated that patients who were counseled improved significantly more than those in the control group on behavioral and cognitive processes of change. Behavioral processes of change and self-efficacy made significant contributions to the multiple regression model explaining self-report and objective measures of physical activity. The construct validity of the intervention was partially supported.

Another intervention developed for the primary care setting was the Physically Active for Life project (PAL) developed by (Pinto, Goldstein, DePue, & Milan, 1998a) to test a physician-delivered intervention to increase physical activity of 335 older adults. Like Project PACE, PAL used a patient-centered model of providing primary care based on the principles of the TM. The study was a randomized trial of activity counseling delivered by community-based primary care physicians. Patient's evaluations of exercise counseling and support materials were obtained at 6 weeks following the initial visit, and at 8 months. The main intent of this study was to determine whether physicians felt the intervention was feasible to use in their primary care practice and whether patients found it acceptable. Most physicians rated the program favorably and they felt the PAL materials improved their ability to provide exercise counseling and that patients increased their physical activity as a result of the intervention. Because the research

staff assessed patient's readiness for physical activity at the initial visit, their role limits the generalizability of the PAL program. Subsequent studies will need to assess the adoption of PAL office procedures (e.g., patient assessment procedure, routine use of exercise prescriptions and manuals) when research staff are not available to provide these roles, or to prompt the use of office tools. This could be a role taken over by nurses.

A third intervention study currently being carried out in the primary care setting is evaluating the efficacy of two practice based physical activity interventions relative to a standard control condition. King et al., 1998 are conducting a 5 year randomized clinical trial, Activity Counseling Trial (ACT), with 874 men and women between the ages of 35-75 years of age. The ultimate goal of ACT is to develop successful strategies that can be implemented in medical delivery systems throughout the U.S. The two primary outcomes for the trial are self-report of physical activity level (caloric expenditure), as measured by the interviewer administered 7-day Physical Activity Recall (PAR), and cardiorespiratory fitness (maximal oxygen uptake). Secondary outcomes include effects on cardiovascular risk factors such as cholesterol, blood pressure, heart rate variability etc. The primary theoretical basis for the ACT interventions and conceptualization of the intervention-related mediating factors is social cognitive theory. The intervention strategy was to alter key mediators of physical activity, because changing these constructs is expected to produce changes in physical activity. ACT is one of many activities that illustrate the recent attention being given to the health benefits of physical activity and the recognition of need to improve physical activity levels of most Americans. Although the results for this study have not been published (targeted for completion Fall 1999) this research has the potential to make substantial contributions to the understanding of how to promote physical activity in the primary care setting.

Although primary health care has been the setting for a number of trials

addressing several cardiovascular disease risk factors simultaneously, few studies have tested the effectiveness of a single intervention on physical activity. Furthermore, while various systems involving referral to local fitness centers have become popular, there has been no controlled evaluation of the effectiveness of this approach. In consideration of this (Bull & Jamrozik, 1998) undertook a large controlled trial in Australia with a focus specifically on the promotion of physical activity to sedentary adults. The hypothesis tested was that there would be no difference in level of physical activity between patients who had received advice and those in the control group at follow-up at 1, 6, and 12 months. The intervention included verbal advice on exercise from the physician and a pamphlet on exercise mailed to the patient's home address within 2 days of his/her visit to the doctor. Seven hundred fifty-three sedentary adults participated. The results revealed that a larger proportion of subjects in the intervention group were now active at each follow-up compared with the control group. One difficulty encountered in this study was the lack of an objective measure such as an accelerometer or pedometer to validate self-reports. Another limitation was nonresponse and the treatment of nonresponders as sedentary. In general the results of this study concur in direction with the few previous studies that have looked at the promotion of physical activity by doctors in the setting of primary health care. It is recommended by the authors that future studies testing interventions on physical activity should consider using an objective measure of physical activity to validate self-reports, include more detailed measuring instruments to minimize the risk of misclassification at baseline and at follow-up, and undertake follow-up in short (1 month), medium (6 months), and long term (long term).

Eaton & Menard, 1998 did a systematic review of physical activity promotion in primary care office settings in Great Britain. This review assessed the efficacy of physical activity promotion among 13,981 adults, aged 17-85+ from 203 practices in eight trials. Odds ratios and 95% confidence intervals were calculated comparing the

number of participants who increased their physical activity or were active at follow-up in the intervention group with a control group. Five of the eight trials were positive with statistically significant results (range 0.91-6.56), but significant biases limited clinical relevance of the outcomes in all of the trials. Concerns about the external validity of the studies because of volunteer practices and low response rates (28%) existed in some studies. Measurement error was inherent in the use of unvalidated self-reported measures of physical activity biasing the results toward no effect in other studies. Furthermore, short follow-up times of one month made clinical relevance difficult to determine, and there was bias in selecting patients during practice consultations convenient to the practitioner rather than a random sample of patients. Sample selection such as this makes generalizability difficult. This analysis shows that to date the scientific evidence for the efficacy of physical activity interventions in primary care is modest at best.

One physical activity intervention approach whereby practice nurses used motivational interviewing based on Prochaska and DiClemente's model of behavior change to test the feasibility of conducting a controlled intervention in primary care was undertaken as a pilot study by (Sims, Smith, Duffy, & Hilton, 1998). Those in the intervention group received a planned activity schedule tailored to their stage of change and the control group received standard advice about the benefits of exercise. Polar heart rate monitors and physical activity diaries were used as objective measures of program effectiveness. Reported activity increased in both groups but a treatment effect was not apparent in this small sample and there was little concordance between self-reported activity level and heart rate. Individuals tended to over estimate how active they were which emphasizes the need to verify self-reported data.

There is considerable potential for providers in the primary care environment to intervene with millions of Americans each year regarding physical activity. Several

studies have documented that counseling by providers can be effective in promoting physical activity, but many gaps in knowledge remain. While studies to improve outcomes continue, the major challenge is to improve the quantity and quality of physical activity interventions delivered in the primary care setting (Leon, 1997). Medical personnel hold a prime, although untapped, potential for encouraging increased physical activity in a large portion of the population. Physical activity is a simple intervention that can reduce disease and disability. By counseling individual patients and acting as leaders to promote physical activity, primary care providers have an opportunity to promote a few simple changes that will enhance the health of all patients (Camaione, Burns, & Chatterton, 1997). Programs, such as the intervention proposed for this study, to communicate to patients the importance of regular physical activity, need to be tested.

Physical Activity Recommendations

Research studies over the past several decades confirm the health benefits of regular physical activity, a concept with foundations in antiquity. Modern scientific investigations of this issue began in earnest in the 1950s with the pioneering work of Karvonen et al in (Blair et al., 1995) on exercise prescription. These experimentalists focused on an exercise threshold necessary to a produce significant increase in estimated peak VO_2. This led to a specific and quantified exercise prescription and to the impression that unless one achieved or exceeded the prescribed dose, no improvements in fitness could be expected. Studies such as these continue to influence health professionals and the public to view exercise as an either-or phenomenon. Other early researchers such as Morris and Crawford in (Morris, 1994) pioneered epidemiological studies of activity and coronary heart disease. These studies emphasize the dose-response gradient for physical activity or physical fitness and various health outcomes. The epidemiologists feel that one of the most important aspects of a physical activity program is the total energy expenditure resulting from the activity. This perspective

allows much more freedom to design activity programs and help sedentary individuals discover what works best for them (Blair, 1995).

The effects of physical activity on particular disease states, the precise dose and intensity of activity and elucidation of biological pathways whereby activity contributes to health are all topics for further research. Although details remain to be clarified it is clear that physical activity improves cardiovascular fitness. Results from clinical exercise studies and epidemiologic investigations remain to be integrated into a consistent and coherent theory of healthful physical activity. There are differences between these two streams that need to be reconciled. Exercise physiologists generally recommend relatively intense activity and a formal approach to exercise prescription, whereas epidemiologic approaches suggest a linear dose response relationship between physical activity and health. This supports the public health contention that it does not matter what type of physical activity is performed: Sports, planned exercise, household or yard work, or occupational tasks are all beneficial. The key factor is total energy expenditure; if that is constant, improvements in cardiovascular health will be comparable (Blair, Kohl, Gordon, & Paffenbarger, 1992).

Sedentary persons can increase their physical activity in many ways. The traditional, structured approach originally described by ACSM and others involved rather specific recommendations regarding type, frequency, intensity, and duration of activity. The recommended activities included fast walking, running, cycling, swimming, or aerobics classes (US Department of Health and Human Services, 1996). Today, recommendations are for the adoption of a lifestyle approach to increasing activity. Recent studies suggest that the amount of activity is more important than the specific manner in which the activity is performed (i.e., mode, intensity or duration of the activity bouts). The health benefits of physical activity appear to accrue in approximate proportion to total amount of activity performed, measured as either caloric expenditure

or minutes of physical activity (Pate et al., 1995).

Haskell, 1995 has extensively analyzed data from studies to determine the characteristics and dose of physical activity related to health consequences, including reduction of CHD. He observed that in the majority of studies, reduced risk of CHD mortality has been associated with predominately light to moderate physical activity (i.e. < 6 METs [1 MET is the resting metabolic rate and is approximately equal to 3.5 ml of oxygen per kg of body weight per minute] or < 7.5 kcal per minute intensity for an average-sized man), performed generally at an intermittent, rather than a continuous, basis. These included activities such as walking, stair climbing, gardening, and household chores, which adults generally performed more frequently than strenuous conditioning exercises or sports.

One of the largest studies done associating changes in physical-activity level and other lifestyle characteristics was the Harvard Alumni Study (Paffenbarger, Blair, Lee, & Hyde, 1993). There were 10, 269 men between the ages of 45 – 84 years of age involved in this research. Results indicate that adopting a physically active lifestyle involving walking, climbing stairs, and playing sports delayed all cause mortality and extended longevity up to 1.6 years. Sedentary alumni who expended less than 1500 $kcal \bullet wk^{-1}$ were at 39% higher risk of early death than their more active counterparts, whereas men who adopted activities of at least moderate intensity (4.5 or more metabolic equivalents) decreased their 8-year mortality risk by 23%.

Stofan, DiPietro, Davis, Kohl, & Blair, 1998 examined physical activity patterns associated with cardiorespiratory fitness and reduced mortality among 13, 444 men and 3,972 women 20 to 87 years of age by estimating energy expenditure ($kcal \bullet wk^{-1}$) and volume ($min \bullet wk^{-1}$) of reported activities among individuals at low, moderate, and high fitness levels (assessed by maximal exercise tests). Average leisure time energy

expenditure of 525 to 1650 kcal•wk^{-1} for men and 420 to 1260 kcal•wk^{-1} for women were associated with moderate to high levels of cardiovascular fitness. These levels of energy expenditure can be achieved with a brisk walk of approximately 30 minutes on most days of the week although men in the moderate to high fitness categories walked between 130 and 138 min•wk^{-1} and women in these categories walked between 148 and 167 min•wk^{-1}.

In the Multiple Risk Factor Intervention Trial (MRFIT), (Leon, Connett, Jacobs, & Rauramaa, 1987) assessed leisure-time physical activity (LTPA) levels and risk of coronary heart disease among 12, 138 middle aged men. Subjects were classified by tertiles of LTPA. Those in the middle tertile, who averaged 48 minutes per day of continuous or intermittent physical activity at an estimated energy cost of 224 kcal/day (about 22 kcal per kg per week), had a 5% and 25% lower risk of CHD mortality at the 7 and 10.5 year follow-ups, respectively, as compared to those in the least active tertile who averaged about 10 minutes of physical activity per day at an approximate energy cost of 74 kcal/day.

The specifications relevant for disease prevention may be different from those relevant for cardiorespiratory fitness. The level of activity necessary to achieve health benefits appears to follow a dose-response relationship, although a minimum level is unknown see Figure 3 (Pate et al., 1995). The lower the baseline physical activity status the greater will be the health benefit associated with a given increase in physical activity. Evidence suggests that relatively modest levels of activity may be beneficial. Any increase in the physical activity level should be encouraged, although one should strive for the level associated with gains in cardiorespiratory fitness (Harris et al., 1989). McMurray, Ainsworth, Harrell, Griggs, & Dale, 1998 addressed this in a study with a sample of 1,664 law enforcement trainees. This research compared physical activity to

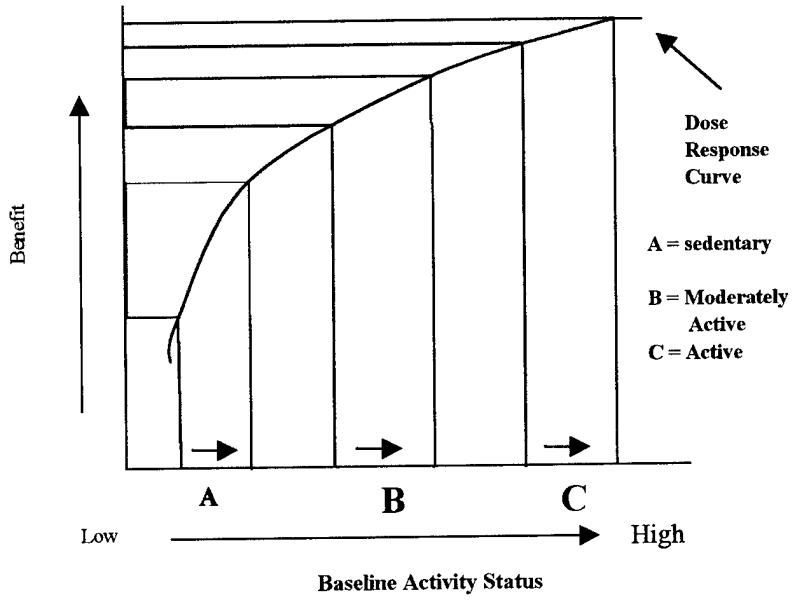


Figure 3. The Dose Response Curve (Pate et al., 1995)

aerobic power to determine which had a larger effect on cardiovascular risk factors. They found that aerobic power ($VO_{2\ max}$) was more closely associated with CVD risk factors than physical activity. Study data suggest that in sedentary, low-fit individuals increasing physical activity without increasing aerobic power had little impact on CVD risk factors. Conversely, increasing aerobic power by as little as 3 $mL \bullet kcal^{-1} \bullet min^{-1}$ (or ~ 1 MET) may ameliorate CVD risk profile. A logical conclusion then is to assume that only activities that are of sufficient intensity to increase aerobic power have the potential to reduce CVD risk factors, a hypothesis which needs further study.

In Germany (Mensink, Heerstrass, Neppelenbroek, Schuit, & Bellach, 1997) investigated different components of leisure time physical activity and their relationship with CHD risk factors in a cross-sectional population-based sample of 5,943 men and 6,039 women, ages 25-69, free of CHD. Among men each 100 $kcal^{-1} \bullet wk^{-1}$ spent on

vigorous activities (7.5-9.0 MET) was associated with significant ($P<0.01$) average differences of –3 mm Hg diastolic blood pressure, and -10 beats•min^{-1} heart rate ($p < 0.001$). Other effects were seen on cholesterol, triglycerides, peak flow and BMI. Among women it was associated with –7 mm Hg systolic blood pressure, and -6 beats•min^{-1} heart rate ($p < 0.001$) as well as peak flow and BMI. Moderate intensity activity (either 3.0-4.5 MET or 5.0-7.0 MET) was significantly ($p < 0.05$) associated with heart rate for men and diastolic blood pressure for women. Moderate intensity activity also impacted HDL cholesterol and BMI for men and HDL, total cholesterol, triglycerides, diastolic blood pressure and peak flow. These results are in agreement with previously reported beneficial associations of leisure time activity and CHD risk factors. For the same amount of energy expended, high intensity activities showed a stronger association with beneficial levels of coronary risk factors than low intense activities. However, low intensity activities conducted frequently may contribute to a beneficial effect on cardiovascular fitness in general.

To evaluate the threshold duration of physical activity to produce training effects, (DeBusk, Stenestrand, Sheehan, & Haskell, 1990) compared the effects of functional capacity of a single "long" (30 minutes) bout of moderate-intensity exercise with 3 "short" (10 minutes) bouts of moderate intensity physical activity between two groups of men, N=36, over an 8 week period. $VO_{2\,max}$ increased significantly in both groups from 33.3 ± 3.2 to 37.9 ± 3.5 ml/kg/min in those performing long bouts, and from 32.1 ± 4.6 to 34.5 ± 4.5 ml/kg/min in those performing short bouts ($p < 0.05$ within and between groups). The results of this study indicate that multiple short bouts of moderate-intensity physical activity produce significant effects on cardiorespiratory fitness.

While vigorous physical activity is likely to be most beneficial, prior recommendations for developing and maintaining cardiovascular fitness may

inadequately address benefits of low to moderate levels of physical activity and subsequent risk factor modification particularly for unfit and sedentary individuals. Moderate physical activities have better compliance rates than vigorous exercise activities, mesh better with daily lifestyle and can be maintained better over time. The correct proportions of lifestyle physical activity are well represented in Figure 4, (Norstrom et al., 1996).

There is little difference between exercising for physical fitness and exercising for health. The key factor is the total energy expenditure of the activity. Both the traditional exercise prescription and the newer recommendations for increasing lifestyle exercise should be promoted. Many individuals will find one of these two approaches appealing (Blair, 1995). It may be easy to get confused by the array of physical activity guidelines, but the basic message can be simply stated. The current approach to improving cardiovascular fitness through physical activity recommendations is summarized well in the British consensus document: "The strategic aim has to be one of making more people, more active, more often" (Sallis & Owen, 1999). The American College of Sports Medicine feels that the fundamental objective of exercise prescription is to bring about a change in personal health behavior to include habitual physical activity. Thus, the most appropriate exercise prescription for a particular person is the one that is most helpful in achieving this behavioral change (American College of Sports Medicine, 1995). The format for many physical activity interventions focus on formal programs involving aerobic activities. Research suggests that a majority of exercisers prefer to engage in physical activity outside of a formal program. Home-based regimens appear to produce better adherence than group based programs. Group programs requiring professional staff are expensive and may not attract those with the most to gain from increased physical activity. Most physical activity interventions involve personal or interpersonal

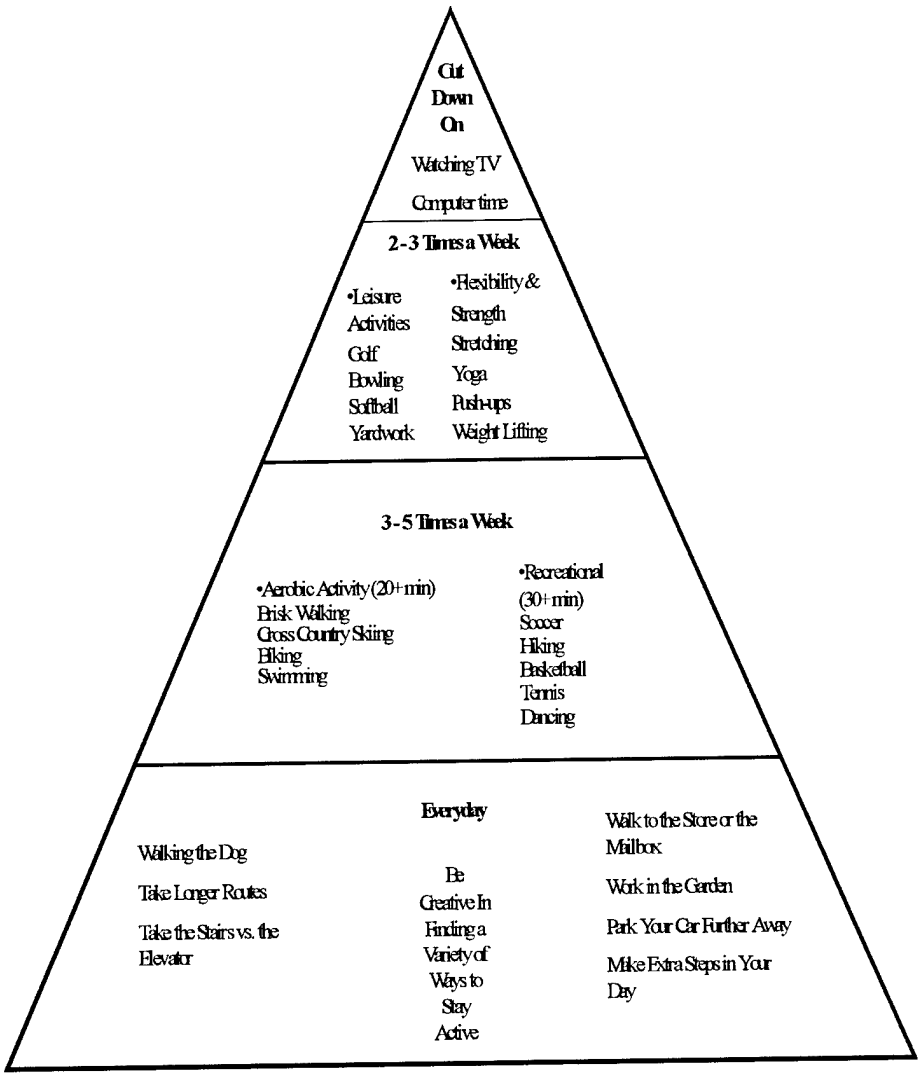


Figure 4. Physical Activity Pyramid adapted from Nostrom et al., 1996

approaches, in which health care professionals meet with participants and engage in counseling and/or physical activities. Continuance of physical activity behavior is therefore dependent on immediate external reinforcement from, for example incentives, group leaders, and peers, which ceases at the end of a program. Multiple level interventions may result in longer-term behavior change. Support from program leaders in the form of personalized attention and positive verbal feedback has been reported as a key factor for successful adherence to exercise programs in all types of environments.

Research is needed that can dismantle the findings from successful treatment packages to determine which techniques or combinations offer the most promise in helping people to adopt and maintain exercise behavior (Robison & Rogers, 1994).

Conclusion

Understanding how to facilitate the adoption and maintenance of physical activity behaviors is a major challenge for health practitioners and researchers. Research to date supports the Transtheoretical perspective that the adoption and maintenance of physical activity behavior change involves progress through a series of stages. Such progress can be accelerated and facilitated by matching particular processes and principles of change to individuals at each stage of change. By using the stages of change model in the primary care setting, to develop sound interventions, practitioners may be able to better effect change in the physical activity habits of their patients (Shumaker et al., 1998). Further study is needed however, regarding specific interventions and their link to improved cardiovascular fitness.

Physical activity and exercise have recently been reconceptualized as energy expenditure, suggesting that regardless of the mode of energy expenditure, if the person expends enough energy, they will receive significant health benefits. When contrasted with structured programs this approach may have much more appeal to inactive or completely sedentary individuals. With such a large portion of American adults remaining inactive or sedentary, better methods of intervening to increase physical activity levels are needed.

Chapter III

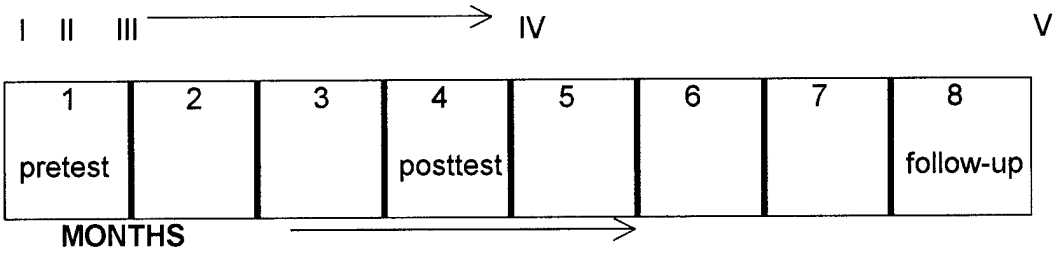
Methodology

This study used a randomized two-group experimental design to analyze the effects of a physical activity modification program (PAMP) on daily activity levels, three behavioral mediators, and two cardiovascular health indicators. Subjects were men and women between the ages of 18 and 45 who were free of heart disease and who could increase their physical activity level without first undergoing a complete medical examination. Once screened and accepted into the study, participants provided written informed consent as approved by Human Subjects Review Committees (See Attachment 3). Qualified subjects were randomized to either the PAMP where they received a readiness to change, stage-matched intervention designed to affect physical activity behavior, or they were randomized to the exercise prescription group (control) where they received minimal assistance in integrating physical activity into their lives. The intervention phase lasted four months with data collection pre- and posttest, and at follow-up (4-months post intervention). Data collection consisted of estimated peak VO_2 testing via bicycle ergometry, resting heart rate (RHR) & BP, estimates of physical activity energy expenditure by 7-day Activity Recall, and scores on the following measures: (1) Self-Efficacy for Behavior Scale [SEEBS], (2) Exercise Motivation Inventory-2, and (3) Exercise Benefits/Barriers Scale. The timeline for this study is outlined in Figure 5.

Research Design

This study used a 2 X 3 mixed two factor, repeated measures, experimental design (see Table 3).

Phases of Study



Phase I = Subject screening & selection

Phase II = Pretreatment data collection

Phase III = Treatment

Phase IV = Post-treatment data collection

Phase V = 4-month follow-up

Figure 5. Study Timeline

Table 3

Research Design

R	O_1	X_1	O_2	O_3
	O_1	X_2	O_2	O_3

R = Randomization

O = Data collection using the following instruments: (1) Self-Efficacy for Behavior Scale [SEEBS], (2) Exercise Motivation Inventory-2, (3) Exercise Benefits/Barriers Scale, (4) Bicycle Ergometry Test, (5) RHR & BP values, (6) 7-day Activity Recall, and (7) The Stages of Change Questionnaire $\mathbf{O_1}$ = data collection pre-treatment measure

$\mathbf{X_1}$ = the intervention PAMP **X** $=_2$ the control exercise prescription

$\mathbf{O_2}$ = data collection post-treatment $\mathbf{O_3}$ = follow-up data collection 4 months post-treatment

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Setting

This study was conducted on a large, US, federally owned military base within

the Washington DC metropolitan area. Two base locations were used. The first setting was the primary care clinic, which is a satellite building to the large medical treatment facility (MTF) on base. The second setting was the Health and Wellness Center (HAWC) located near the base fitness center.

Subjects

Subjects for this study were recruited from the TRICARE Northeast Catchment area for military health care. The population of eligible subjects was composed of male and female patients between the ages of 18 - 45, who were eligible to receive care in the MTF where the study was conducted. This population of patients included active duty personnel, dependents and retirees. The age criterion was based on the exercise testing and participation guidelines established by the ACSM (American College of Sports Medicine, 1995). A modified Physical Activity Readiness Questionnaire (PAR-Q), administered and signed by the patient's primary care provider (see Appendix A) Corbin & Lindsey; Nieman; Ross, Jackson and Williams in (Cardinal, 1993) was used as a noninvasive screening tool prior to entry of any patient into the study. Potential study participants were not acutely ill and were free of CVD or other conditions that would limit mobility. Table 4 presents all inclusion and exclusion criteria that were used for PAMP. Current or past level of physical activity participation was not a criterion for inclusion or exclusion.

Power analysis for this study was based upon research conducted with the Activity Counseling Trial where it was determined that a power of .90 allowed for the detection of a 1.1 (1.3-0.2) $kcal \cdot kg^{-1} \cdot d^{-1}$ difference in total daily energy expenditure and a 7% change in VO_{2max} (Blair et al., 1998). Interpolation of Steven's K group MANOVA table for a two group MANOVA with 3 variables and a power of .90 requires an n = 60. This permitted detection of a moderate effect size with $\alpha < 0.05$ (Stevens, 1996). Assuming a 20% loss to follow-up, the adjusted n = 72. Equal numbers were in each

treatment group, making each group = 36. The sample size may actually be larger than necessary due to the repeated measures design. The potential subject pool was 100 each day of recruitment.

Table 4

Inclusion/Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
A. Military eligibility for care B. Adult males & females 18 ≤ age ≤ 45 C. Stable health D. Consent to be in study E. Able to and agreeable to follow PAMP F. Able and agreeable to complete all testing G. Not anticipating a move or an extended temporary duty assignment within the next calendar year	A. History or evidence of CHD: ⇨ Previous MI ⇨ Positive stress test ⇨ Chest pain or discomfort at any level of exercise ⇨ Angina ⇨ Currently on beta blocking medications ⇨ Cardiomyopathy ⇨ Pacemaker B. Cerebral vascular disease C. Peripheral vascular disease D. Congestive heart failure E. Arrhythmias ⇨ Atrial fibrillation ⇨ Complex ventricular arrhythmias ⇨ Second or Third-degree heart block ⇨ Valvular heart disease F. Malignant cancer in the last 3 years G. Type 1 or 2 uncontrolled diabetes mellitus H. Exercise induced asthma or uncontrolled asthma I. COPD J. Psychosis K. Eating disorders, unresolved alcohol or drug dependence L. Pregnancy any time during study M. Military Medical Profile N. Pending disciplinary action O. Hearing or sight impairments limiting ability to use telephone or to answer questionnaires P. Non-English Speaking/Reading that would preclude understanding verbal/written material Q. Functional limitations R. Anticipating move or deployment

Procedures

Details of the procedures for this research are presented in Appendix B. Individuals randomized to the PAMP received physical activity counseling and recommendations based on their identified stage of change and their physical capabilities. Those randomized to the control group received an exercise prescription (see Attachment 4) after their initial estimated peak VO_2 testing, and they were provided with information about the importance of physical activity to health from the American Heart Association (AHA). The PAMP group received the manual Living with Exercise by Steven Blair, (Blair, 1991), and other handouts determined appropriate to their stage of change. The PAMP also received periodic motivational telephone calls, electronic mail and postcards. Data collection for all participants was identical (see procedure timetable provided in Table 5). The Primary Care Clinic was the site for subject recruitment, initial staging, and informed consent. Data collection occurred in large part at the HAWC due to the crowded clinic environment and a lack of privacy at the clinic.

Measurement

Background

Measures related to physical activity comprise two broad categories, laboratory methods and field assessment methods. Laboratory methods use physiologic methods to measure energy expenditure (e.g. calorimetry, oxygen consumption) or biomechanical methods (e.g. photographs, force transducers) to measure muscular activity. For the most part laboratory methods are not useful in the field for measuring activity and energy expenditure. They are, however, important to understanding the techniques for validation of simple practical field methods.

The second broad category of field methods has many subcategories. The first group of measures includes behavioral observation and time/motion analyses. For want of a suitable criterion, observations for energy expenditure have never been adequately

validated, however, face validity seems good when the observations are carefully made and recorded. The major obstacle with these methods is the prohibitive cost and time involved in data collection. The observation method is often used with children or in small studies and as a standard to which other techniques can be compared.

A second field measure is the diary. This kind of data collection involves little expense, does not require an observer and can be done simultaneously by many subjects. The drawbacks include the time and cost of processing large volumes of data and validity of the recording.

Questionnaires and interviews comprise the next large group of field methods. The specific purpose of the survey determines the procedures and questions to be asked. Questionnaires are relatively inexpensive and they are really the only method feasible, at the present time, for large population surveys. Specific activities can be identified together with frequency and duration. The most limiting factor with questionnaires is the accuracy of the subject's recall and their reliability and validity.

A fourth group of field measures uses movement assessment devices. Several devices exist for this purpose, including pedometers and portable accelerometers (the actometer, the caltrac, and tri-trac accelerometers). These instruments measure steps taken and/or the acceleration of the body in varying directions. Stumbling blocks to the use of these devices include sensitivity (reliability & validity) and cost.

Estimating energy expenditure from physiologic response to activity is the final group of field measures. These physiologic data include body temperature, blood pressure, ventilation, electromyography, and heart rate. Although all of these measures reflect the rate of energy expenditure, heart rate is the most practical response to measure in the field.

Table 5

Procedures Timetable

# of weeks after pre-test	Precontemplation/ Contemplation	Preparation	Action/ Maintenance	Exercise Prescription Control
+ 2		P		
+ 3	P	M	P	
+ 6	M	M	M	
+ 8	M	M	M	
+ 10		P		
+ 12	P	M	P	
+ 14	M	P	M	
+ 16	Cardio & Q	Cardio & Q	Cardio & Q	Cardio & Q
+ 30	M	M	M	
+ 32	Cardio & Q	Cardio & Q	Cardio & Q	Cardio & Q

Key: M = mail, **P** = phone call, **Q** = complete all questionnaires,

Cardio = complete bike test, BP, obtain 7-Day Physical Activity Recall Booklets

A relatively new approach for estimating energy expenditure that is potentially applicable to both laboratory and field studies is the method of doubly labeled water (DLW). The expense of the technique, however, makes it impractical for use in large studies. This method involves the ingestion of a quantity of water with a known concentration of isotopes of hydrogen (deuterium) and oxygen (oxygen-18). The production of carbon dioxide can be calculated from the difference in the elimination rate of these two isotopes in the urine. This enables the estimation of respiratory quotient,

from which one can calculate oxygen uptake for the time period. This method requires only periodic sampling of body fluids; it is nonrestrictive and ideally suited for use with free-living subjects. Doubly labeled water is the gold standard for assessing energy expenditure, but because of the cost of oxygen-18 (one measurement is between $400-$600) the method is limited to small groups (Montoye, Kemper, Saris, & Washburn, 1996).

Study Measures

Exercise-Specific Self-Efficacy Scale (ESSES)

The ESSES (McAuley, Wraith, & Duncan, 1991) (see Appendix C) is a 13-item questionnaire that assesses efficacy cognitions related to perceived ability to continue with physical activity in the face of barriers such as when the person is tired, in a bad mood, or on vacation. This is a measure of perceived self-efficacy - a judgment by the participant that he/she is able to organize and execute physical activity behavior under various conditions. It is not a measure of outcome expectations - judgments of the likely consequences of physical activity behavior (Bandura, 1997). Individuals are asked to indicate on a scale of 0 (not at all confident) to 100 (highly confident), how confident they are in participating in physical activity. A total self-efficacy score is computed by summing the confidence ratings and dividing by the total number of questions, resulting in a maximum possible efficacy score of 100 (Oman & King, 1998). Cronbach's alpha internal consistency was reported as .85, and exercise efficacy was positively correlated (N = 80) with exercise frequency and positive-affective reactions. (Ostrow, 1996). Cronbach's alpha in this study was .90 (N = 71).

Exercise Motivation Inventory-2

The exercise motivation inventory (EMI-2) is a measure of an individual's reasons for exercising (Markland, 1997), (see Appendix D). The EMI-2 is a 51-item inventory containing 14 subscales: Stress Management, Revitalization, Enjoyment, Challenge,

Social Recognition, Affiliation, Competition, Health Pressures, Ill-Health Avoidance, Positive Health, Weight Management, Appearance, Strength and Endurance, and Nimbleness. For each item, participants respond to a 5 point scale (0 = not at all motivating to 5 = very motivating). This measure was used to differentiate motivational orientation at each stage of behavior change.

Cronbach's alpha reliability ranges from .63 to .92 for the subscales. Test-retest reliability (n = 57) ranged from .59 to .88 across a 4- to 5- week interval. In this study Cronbach's alpha was .82 (N = 71). Discriminant validity of the EMI was supported; gender, age, and type of physical activity involvement mediated participants' responses to the EMI (Ostrow, 1996). A panel of five expert judges reviewed content validity, and the items were reworded in an attempt to reflect personal reasons for exercise. To establish concurrent validity, two subscales from the EMI (Revitalization and Enjoyment) were correlated with a previously established interest/enjoyment measure of intrinsic motivation; correlations ranged from .50 to .55 and were higher than the other EMI subscales. Further testing of the instrument's concurrent validity as well as determining predictive validity are currently underway. Correlations between the EMI sub-scales and social desirability are low (.01 to .23) (Duda, 1998).

Exercise Benefits/Barriers Scale

The Exercise Benefits/Barriers Scale (EBBS)(Sechrist, Walker, & Pender, 1987) (see Appendix E) measures perceived benefits and perceived barriers to exercise, since these can either enhance or prevent health-promoting behaviors such as physical activity (Pender, 1996). The EBBS contains 43 items and two subscales. The 29-item Benefits scale (e.g., "feel relaxed" and "self-concept improved") has five factors related to physical activity participation: life enhancement, physical performance, psychological outlook, social interaction, and preventive health. The 14-item Barriers scale (e.g., "exercise is hard work" and "family not encouraging") has four factors related to physical

activity participation: exercise milieu, time expenditure, physical exertion, and family encouragement. Individuals respond to each item on the benefits scale using a 4-point Likert scale with anchorings 1 (*strongly disagree*) to 4 (*strongly agree*). A single EBB score is calculated by summing benefits and barriers scores. The possible range of scores on the barriers scale is 14-54 points, with a higher score indicating fewer perceived barriers. The benefits scale ranges from 29-116 with a higher score also indicating more benefits. The total benefits plus barriers rating can range from 43-172 points, the higher the score, the more positively one perceives physical activity benefits in relation to physical activity barriers (Ostrow, 1996 & Poole, 1992).

Initial psychometric evaluation was based on the responses of 650 adults and included item analysis, factor analysis, and reliability estimates. Factor analysis yielded nine factors, five benefits and four barriers, which explained 64.9% of the variance in the 43-item instrument. Second order factor analysis resulted in a two-factor solution, one a benefits factor and the other a barriers factor. The standardized Cronbach's alpha reliability coefficients were: .95 for the total scale, .95 for the benefits scale, and .89 for the barriers scale. Two-week test-retest reliability correlation coefficients are 0.89 for the entire scale, 0.89 for the benefits scale, and 0.77 for the barriers scale (Sechrist, 1987). For this study Cronbach's alpha was .90 (N = 71).

Exercise Stages of Change

Five questions (Marcus & Owen, 1992) (see Appendix F) were used to assess current stage of exercise behavior. The five stages were hypothesized based on previous work in the areas of smoking cessation and exercise studies. Marcus (1992b) demonstrated the reliability of the stages of change instrument. The Kappa index of reliability over a 2-week period was .78. Cronbach's alpha in this study was .83 (N = 71). Concurrent validity for this measure was demonstrated by its significant association with the Seven Day Recall Physical Activity Questionnaire (Marcus, 1992a).

7-Day Physical Activity Recall

A self-report 7-day Physical Activity Recall Instrument, Appendix G, was used to assess average daily free living physical activity METS -metabolic equivalent (Blair et al., 1985). The 7-day Physical Activity Recall is an interviewer-administered instrument that estimates energy expenditure in physical activity over 1 week. Subjects are queried about daily exposure to moderate (3.0-4.9 METS), hard (5.0-6.9 METS), and very hard (7.0 or more METS) physical activities as well as sleep time (1 MET); activities are scored by intensity if 15 minutes or longer. A prompting list provides examples of activities in each category. The week is separated into weekend days and weekdays. Each intensity level is assigned a MET value. Time spent in light physical activities (1.1-2.9 METS) is inferred (by subtraction) from the responses after total hours in sleep are determined and data are converted to $kcal \bullet kg^{-1} \bullet d^{-1}$ (Kohl, Dunn, Marcus, & Blair, 1998). Because most adults in developed countries spend the greatest part of their days in light activity, it takes little time to recall the time spent in moderate, hard, or very hard activity. Thus a person need remember only those activities that were at least moderate energy cost. The more vigorous the activity, the more likely it seems that specific details will be remembered.

The 7-day recall has acceptable reliability and validity. When compared to physical activity as measured by Doubly Labled Water, other questionnaires, monitoring devices, caloric intake, and physical fitness of respondents the 7-day recall had statistically significant correlations, $p < 0.05$, as follows: 7-day diary = .81, Doubly labeled water = .30, Caltrac accelerometer METs (7 days) = .49, Caloric intake kcal = .35, Framingham questionnaire = .45, Caltrac accelerometer (movement score) = .57, peak VO_2 = .30, and Submaximal (treadmill) = .32 (Montoye, Kemper, Saris & Washburn, 1996). Reliability of the 7-day recall was assessed with 53 adults 2-weeks apart. In this population the reliability coefficient was .67 for kilocalories per day, but only

.34 when expressed as kilocalories per kilogram of body weight (Sallis in Montoye et al., 1996). It was noted that vigorous activity and sleep are recalled more reliably. In a later study with 45 adults, administered twice, one week apart and expressed as kilocalories per day the reliability coefficients were .77 and .84 (Williams, Klesges, Hanson & Eck in (Montoye et al., 1996). Most physical activity questionnaires have reliabilities greater than .75 but because of the one-week time frame of the 7-day recall, test-retest may include real change as well as questionnaire reliability (Jacobs, Ainsworth, Hartman, & Leon, 1993). Test-retest reliability data have been fairly stable for light (r = .65), hard (r = .31), very hard activity (r = .61), and hours of sleep (r = .74) (Marcus & Simkin, 1993).

Resting Heart Rate (RHR)

The resting heart rate is influenced not only by the strength of the heart muscle but also by the efficiency of other parts of the circulatory system. Among aerobically fit individuals (maintainers), a RHR in the 60s, 50's, and even 40s is not uncommon. Heredity also plays a role in establishing the resting heart rate. Even some individuals who are not aerobically fit may have inherited a low resting heart rate. Similarly, some highly trained individuals have average (70 to 80 bpm) resting heart rates.

Individuals in this study were instructed on taking their own resting heart rate (RHR) for 15 seconds after waking naturally on 3 days out of the week. First thing in the morning was recommended because the person hasn't been startled awake by the alarm clock. Subjects were told to obtain a RHR on at least three different occasions. Instruction and return demonstration on the proper method to palpate the carotid and/or radial pulse were given to each subject at the time of initial bicycle ergometry testing (Bishop & Aldana, 1999). See Appendix H.

Aerobic Capacity

An estimated aerobic capacity (estimated peak VO_2) was assessed by use of submaximal cycle ergometry. This is a surrogate measure of an individual's

cardiovascular fitness level. Cycle ergometry provides an estimate of an individual's aerobic capacity by submaximal heart rate response to incremental exercise. Cycle ergometry has been used since the late 1950's and is a safe and effective field test (Heyward, 1998). The Monarch 818E Cycle Ergometer was used. The protocol for the submaximal cycle ergometry test is presented in Appendix I. The cycle ergometry test relies on a linear relationship between HR and work rate (VO_2) once a HR of approximately 110 beats per minute is reached. The intent of the test is to extrapolate the line describing the HR-work rate relationship out to the person's age-adjusted maximal HR to estimate the person's peak VO_2 . Each stage of the test lasted 3 minutes, unless a person's HR has not yet reached a steady state (greater than 5 beats per min difference between 2^{nd}- and 3^{rd}- min HR). In that case an extra minute was added to the stage. The pedal rate was maintained at 50 rev per min, so that, on the Monarch cycle ergometer, a 0.5-kp increase in load is equal to 150 kpm per min (25 W). Seat height was adjusted so that the knee is slightly bent (5°) when the pedal was at the bottom of the swing through 1 revolution (Howley & Franks, 1997). This was kept constant for all subsequent tests.

Proper selection of the initial work rate and the rate of progression of the work rate on the cycle ergometer took into consideration body weight, gender, age, and level of fitness. In general, absolute $VO_{2\ max}$ (L per min or ml/kg/min) is lower in smaller people; women have lower absolute $VO_{2\ max}$ values than men; VO_2 max decreases with age; and inactivity is associated with low $VO_{2\ max}$. This was addressed by starting everyone at 150 kpm per min and using the HR response to that specified work task to set subsequent stages in the test (Howley & Franks, 1997). The equipment required was a cycle ergometer, clock or stopwatch and a heart rate monitor. Validity of this test provides a correlation to peak VO_2 of approximately 0.85-0.90. Failure to meet the assumptions (heart rate and oxygen uptake are linear functions of work rate), underlying

submaximal exercise tests produces a ± 10-20% error in the prediction of peak VO_2 from submaximal heart rate data (Heyward, 1998).

Resting Blood Pressure

Resting blood pressure was assessed using a calibrated automated blood pressure machine (Dynamap). Increased physical activity has been shown to lower the systolic blood pressure (SBP) and in combination with a lower heart rate adds to cardiovascular fitness. A lower SBP and a lower RHR make it easier for the coronary arteries to meet the oxygen demand of the heart. The work of the heart is proportional to the product of the heart rate and systolic blood pressure (rate-pressure product or double product) (Howley & Franks, 1997).

Blood pressures were taken in the same arm with the same blood pressure machine during each measurement time prior to bicycle ergometry testing. Time of day varied since testing was done anywhere between 6 am and 7 pm. The cuff overlapped two thirds of the arm. After resting for 15 minutes, the subject had both feet flat on the floor and was in a relaxed position with the arm supported. The cuff was wrapped securely around the arm at heart level, usually with the tube on the outside of the arm. All blood pressure measurements were carried out by the same person.

The PAMP Intervention

While early editions of the Guidelines for Exercise Testing and Prescription focused on medically supervised exercise programs, this emphasis has been both amended and expanded to include a broad public health perspective of physical activity and exercise. The need for supervised programs has not diminished, but it is increasingly clear that less regimented approaches are needed to promote activity efforts. The vast majority of physically active adults are not involved in structured, formal exercise programs, nor do they need to be (American College of Sports Medicine, 1995). In the past most exercise interventions focused on formal programs involving aerobic

activities performed at ≥ 60% of the cardiovascular capacity for at least 20-30 minutes. However, significant health benefits can be achieved with light to moderate forms of physical activity such as stair climbing and walking (Blair & Leon in (Robison & Rogers, 1994). Furthermore, research suggests that many exercisers prefer to engage in physical activity outside a formal program (King, Merson & Shephard in (Robison & Rogers, 1994).

The intervention for this study was based on the manual Living with Exercise by Steven Blair (Blair, 1991). This manual is currently under revision and copies of the current version are no longer in print, therefore, permission was obtained from the publisher to reprint a limited number of copies for use in this study. The foundation of this manual is the stages of change. It emphasizes moderate-intensity, lifestyle activities and takes a behavioral, problem solving approach to helping people initiate and maintain increased physical activity levels. Developing the protocols for a physical activity intervention that is realistic and useful in a busy primary care environment requires application of the best available behavioral science data and theory. Because knowledge about physical activity has not been shown to be major determinant of behavior change, the approach of this intervention went beyond simple information giving. Instead, this intervention mirrored the PACE intervention in trying to target changes in confidence, motivation, and beliefs about the personal benefits of physical activity in an attempt to influence physical activity behavior (Patrick et al., 1994).

The PAMP was, in large part, a self-administered intervention that capitalized on what people were presumed capable of accomplishing on their own with minimal help or assistance from practitioners (Black & Cameron, 1997). There was an initial personal contact with each subject to provide instructions about use of the Living with Exercise manual and other stage- matched material. Subsequent contacts were made by telephone by e-mail, and in writing to verify progress. Other personal contacts occurred

when estimated peak VO_2 was measured. All intervention handouts and materials are provided as attachments.

Health-promoting behaviors are affected by a constellation of variables, including situational factors, interpersonal factors, and personal benefits (Nies et al., 1998). Successful interventions must appeal to the individual's interests and capabilities. A single counseling strategy is not appropriate for all patients. The concept of "stages of change" classifies patients according to their readiness to become physically active and permits pairing a counseling approach to a patient's stage. Identifying the correct stage of behavior allows the practitioner to tailor recommendations to the needs of the patient and to use time effectively (Patrick et al., 1994).

It is important for the practitioner to understand why people choose to be physically active. Knowing a person's motives enables the practitioner to better plan the intervention. Also knowing the range of motives represented at each stage of change enables the practitioner to offer sufficient variety to maintain interest. Understanding peoples' motives also helps practitioners plan strategies to help clients maintain current physical activity levels (Willis & Campbell, 1992). For adults regardless of age or gender, the most common motive for physical activity is improved health and fitness. Improved appearance is also a strong motivating factor, especially for women of all ages. Other motives for participation are enjoyment, social experience, and psychological benefits. It must be kept in mind that people usually engage in physical activity for more than one reason and that time and situational influences tend to change motives (Willis & Campbell, 1992). Participation motives such as exercising for enjoyment, challenge, skill improvement and affiliation have been characterized as intrinsic while exercising for reasons such as appearance improvement, weight control, and social recognition have been considered to reflect extrinsic motivation.

The PAMP intervention was intended to increase participants' confidence in

performing physical activity, increase the benefits they perceive they gain with physical activity, decrease the barriers associated with physical activity, and increase their motivation to be physically active. It was anticipated that physical activity and its benefits would increase by affecting these mediators.

The intervention for this study had several goals based upon providing appropriate support to participants relevant to their stage of change. One goal was to increase physical activity and total daily energy expenditure. This was done through interactive use of the Living with Exercise Manual, which recommends increasing daily physical activity through less mechanized daily activities, increasing movement, and seeking opportunities to expend energy.

A second goal was to increase physical activity self-efficacy. This was achieved by assisting participants to set realistic exercise goals that allowed for successful accomplishment. Increasing physical activity self-efficacy was done by demonstrating behavior through role modeling, and, by letting participants know what a good job they were doing (verbal persuasion). Self-efficacy also was increased by informing participants that increased HR, sweating and faster breathing were all signs of a good and successful work out, not that something was wrong with them.

Promoting movement through the stages of exercise behavior change was another goal of the PAMP. The intervention for individuals in the early stages of change focused on increasing use of the cognitive processes. This involved increasing awareness of the benefits of physical activity and encouraging thinking about becoming active. In later stages the focus was more on the behavioral processes, encouraging individuals to begin exercising and suggesting strategies for maintaining an active lifestyle (Marcus, King, Clark, Pinto, & Bock, 1996).

Specific strategies for precontemplators involved targeting perceived behavioral control and attitude. The intervention focused on accessibility to resources and

opportunities. Emphasis was placed on the health benefits of exercise, namely fitness, physical and mental health and weight control. Assessing and clarifying knowledge, beliefs and concerns about physical activity was important. Participants were asked what they saw as potential personal benefits of physical activity, what they felt were the biggest reasons for their inactivity, and how these roadblocks might be handled. Personalized information was given to precontemplators about the benefits and risks of physical activity. Addressing their feelings and providing support was essential to increasing the subject's awareness of the benefits of exercise and for encouraging them to think about becoming active. Further assistance was conveyed by being understanding and by providing praise and support for new thoughts about increased activity. Perceived behavioral control and attitude was targeted to increase awareness of the need to be more physically active.

For contemplators opportunities were provided for access to resources that fostered the perception of having control over their own physical activity behavior. Suggestions were made about easy to do, pleasant, and entertaining physical activities such as walking or other low-cost recreation.

Participants in the preparation stage were assisted to set realistic goals, establish a start date, and to look at clothing, footwear, and equipment possibilities. Intervention strategies for contemplators and preparers overlapped in many respects. Once knowledge, beliefs and concerns about physical activity were assessed, their interest in thinking about increasing physical activity was praised, and their reasons for wanting to become more active were reinforced. Remaining barriers to activity were identified. Eliciting preferences and negotiating initial steps toward physical activity helped individuals overcome barriers. Opportunities and access to resources and supports that fostered perception of having control over their own physical environment were provided. Discussion of the manual Living with Exercise and encouragement to use of this

valuable resource was paramount. Subjects were congratulated for wanting to increase their physical activity. Each person was asked to list two main benefits of their physical activity program as well as activities they enjoyed and where and when they did them. They also were asked to identify a family member, friend or coworker who supported their new activity program. Discussions centered on the act of exercising and how they felt afterwards as well as how they felt if they did not exercise. It was important to ascertain environmental facilitators and barriers and what exercise behaviors could be substituted for non-exercise behaviors. Individuals were encouraged to focus on whether they believed they could make a permanent commitment to increased activity and exercise, and how they reminded themselves to exercise regularly.

Those in action stage of change received reinforcement of their positive physical activity behavior, while the maintainers were assisted with the prevention of relapse and the consolidation of gains attained. There was overlap in the intervention strategies for those in action and maintenance stages just as there was for those in contemplation and preparation. Participant's knowledge, beliefs and concerns about physical activity were assessed and clarified. Discussions featured current exercise habits, establishing new goals, and reviewing physical activity contracts or writing new ones if necessary. Resources and supports such as the HAWC were identified, and consideration was given to creative ways to maintain a physical activity program while traveling or when other barriers presented themselves. These individuals were also encouraged to use the manual Living with Exercise. Clothing, footwear, and equipment and exercise possibilities at home were addressed as needed. Assistance was provided through understanding and the provision of praise and support for current activity. The idea of consequences for taking steps either to be physically active or not to be physically active was introduced. Formation of buddy systems for those interested in supporting others in their physical activity programs were suggested, and information about local events to

participate in were offered.

Data Analysis

Individuals' stage of physical activity change status was assessed as positive (forward), negative (backward), or unchanged across three time periods (1) pretest→ posttest; (2) posttest → follow-up; and (3) pretest → follow-up. Once stages of change data were coded, a Mann-Whitney U test was used to compare movement from stage to stage across time between the two groups. Chi-squared was used to assess movement across time but within one group at a time. Significant demographic differences between the control and PAMP were also identified by Chi squared tests.

Differences between the PAMP and control group at each testing period for the dependent variables (behavioral measure scores, cardiovascular health scores, and physical activity levels) were identified at using t-tests. Levene's test for equality of variance was used when group sizes were unequal.

Three separate 2 group x 3 time repeated measures multivariate ANOVA's (RM MANOVA) were performed. The 2 groups in all three analyses were the control group and the PAMP and the three time periods were pre, posttest and follow-up. There were three groups of dependent variables. The first group was the activity level dependent variables, flights of stairs climbed per day, and blocks walked per day. The second group was the behavioral mediator dependent variables, measures of physical activity self-efficacy and decisional balance. The last group was the cardiovascular health indicators, estimated peak VO_2 and blood pressure.

The analytic technique, MANOVA, was a useful technique to test the significance of the effects of the categorical independent variables (IV) on the continuous dependent variables (DV) that were correlated. The assumptions of MANOVA closely parallel those of ANOVA. The three necessary conditions are: (a) multivariate normality (b)

homogeneity of the variance matrices, and (c) independence of observations (Katz, 1999). Use of MANOVA was useful in controlling Type I error by taking into account the correlations between the dependent variables. By performing an overall omnibus test of significance first – the MANOVA – one guards against the chance of committing a Type I error that might occur as a result of unwarranted multiple ANOVAs (Stevens, 1996). MANOVA allowed for a much richer analysis of data for two reasons. First by taking the correlations between all dependent variables into consideration at once, there was redundant information in the results of the MANOVA. Second, group differences could be detected for a group of variables. Taken individually, the dependent variables might not have shown significant group differences, but taken as a whole – as a system defining one or more theoretical constructs – differences impacted by the independent variable could be revealed (Stevens, 1996).

Chapter IV

Results

Results address the three research hypotheses: (1) Physical activity behavior changes (confidence, motivation, associated benefits) will be more positive for participants in the Physical Activity Modification Program (PAMP) than among those in the control group at posttest and follow-up. (2) Those in the PAMP will increase their daily physical activity (caloric expenditure, stairs climbed, blocks walked) and reach a higher stage of physical activity behavior change at posttest and follow-up than those in the control group. (3) PAMP subjects will improve their cardiovascular health (estimated peak VO_2, blood pressure, resting heart rate) more than subjects in the control group at posttest and follow-up.

Subjects

Initially 135 subjects volunteered to take part in this study. Of this number, 96 (71%) remained in the study and were pretested. The demographic characteristics of the 39 individuals who failed to continue in the study at this point were unavailable. Age range for all participants in the study was 18-44 years of age; weight range was 95-266 pounds; body mass index ranged from 19-41; estimated peak $V0_2$ range was 24-64 ml/kg/min; systolic blood pressure had a range of 90-154 mm Hg with a diastolic range of 53-102 mm Hg. A preponderance of individuals were 30 - 32 years old, enlisted (56%), Caucasian (54%) females (60%) who had some college education. Only seven participants smoked and most engaged in some form of physical activity, although not on a regular basis. There was an even distribution of individuals among the stages of physical activity change. Overall the participants were motivated and they had moderate levels of physical activity self-efficacy. Benefits associated with physical activity were generally higher than associated barriers. Most individuals spent about 3.5 days a week

for approximately 45 minutes a session engaged in some form of continuous physical activity. They climbed approximately 5 flights of steps a day and walked a mean of 11 blocks per day. The average weight of participants was 160 pounds with a body mass index of 25. Blood pressure was normal for most individuals and averaged 120/70 with a resting heart rate of 65. Aerobic capacity, estimated peak VO_2, averaged 37.5 ml/kg/min.

Dropouts vs. Adherents

Demographics

Of the 96 participants pretested in the study, 77 (80%) completed the intervention. In comparing the 77 subjects who completed the intervention to the 19 who did not there were no significant differences between the groups in military status or rank, gender, education level, or race (Table 6). Although not statistically significant (χ^2 = NS) a larger percentage (84%) of dropouts had educational levels less than an associate's degree in comparison to (63%) of the group that finished. The group that finished had a larger number of subjects with a bachelor's degree or higher than those who did not (39% vs. 16%). Among those who did not complete the study there were more from the enlisted corps (42%) versus the officer corps (11%), although, the data were missing for nine of the subjects. More subjects on active duty (58%) dropped out than did dependents (42%).

Behavioral Mediators

Those who completed the study had higher mean scores on eight of the fourteen motivation subscales compared to those who dropped out. However, only one of these differences was significant (Table 7). On the subscale of engaging in physical activity behavior for the purpose of feeling healthier (positive health) subjects who dropped out of the study rated positive health significantly lower than those who finished, $t = 2.471$ $df = 92$, $p < 0.05$. The dropouts also felt there were fewer barriers to physical activity,

Table 6

Demographics Dropouts vs. Adherents

Characteristic	Dropouts n = 19 n(%)	Adherents n = 77 n(%)
Gender		
Male	8(42%)	30(39%)
Female	11(58%)	47(61%)
Military Status		
Active Duty	11(58%)	57(74%)
Dependent	8(42%)	20(26%)
Level of Education		
High School	3(16%)	21(27%)
High School/Some College	9(47%)	22(29%)
Associates Degree	4(21%)	5(7%)
Bachelor's Degree	1(5%)	12(16%)
Master's Degree	2(11%)	15(20%)
Professional Degree	-	2(3%)
Military Rank		
Enlisted	8(42%)	49(64%)
Officer	2(11%)	25(32%)
Missing	9(47%)	3(4%)

$t = 2.096$ $df = 91$, $p < 0.05$, than those who remained (Table 8). Although not significant, mean scores on physical activity self-efficacy were higher for the adherents. The benefits associated with physical activity did not differ significantly between adherents and dropouts although the mean score differences indicate that adherents did associate more benefits with activity than dropouts.

Table 7

Motivational Characteristics Dropouts vs. Adherents

Motivation Subscale	Dropouts n = 18 mean ± SD	Adherents n = 76 mean ± SD
Stress Management^	3.8 ± 1.1	3.6 ± 1.3
Revitalization	4.0 ± 1.0	3.9 ± 1.1
Enjoyment	3.6 ± 1.4	3.6 ± 1.3
Challenge	3.3 ± 1.3	3.0 ± 1.3
Social Recognition	2.2 ± 1.6	1.7 ± 1.4
Affiliation	2.1 ± 1.5	2.1 ± 1.5
Competition	2.3 ± 1.9	2.1 ± 1.8
Health Pressures	1.3 ± 1.5	2.0 ± 1.4
Ill Health Avoidance	3.9 ± 1.0	4.2 ± 1.0
Positive Health	4.1 ± 1.1	4.6 ± 0.6*
Weight Management	4.1 ± 1.4	4.1 ± 1.2
Appearance	4.0 ± 1.1	3.9 ± 1.0
Strength & Endurance	4.4 ± 0.7	4.3 ± 0.9
Nimbleness	4.0 ± 0.9	4.0 ± 1.1

* $p < 0.05$ ^ higher scores = more motivated

Table 8

Behavioral Mediators Dropouts vs. Adherents

Characteristic	Dropouts n = 18 mean ± SD	Adherents n = 76 mean ± SD
Physical Activity Self-Efficacy^	53.9 ± 23.5	56.4 ± 19.9
Benefits of Physical Activity	90.4 ± 18.6	95.0 ± 10.7
Barriers to Physical Activity	23.9 ± 6.7	27.0 ± 5.4*
Benefits + Barriers Total	136.8 ± 21.4	138.0 ± 13.8

* $p < 0.05$ ^ higher score = more physical activity self-efficacy

Stage of Physical Activity Change

The groups were closely matched on stage of change with the exception that fewer dropouts were in the action stage of change - engaged in physical activity regularly but only for the past six months - (16% vs. 25%) see Table 9.

Table 9

Stage of Physical Activity Change Dropouts vs. Adherents

Stage of Change	Dropouts n(%)	Adherents n(%)
Precontemplation/Contemplation	6(32%)	16(21%)
Preparation	3(16%)	17(22%)
Action	3(16%)	19(25%)
Maintenance	6(32%)	25(32%)

Physical Activity Levels

Both adherents and dropouts were active an average of 3.5 days a week (Table 10). Adherents were active for longer time periods per activity session, 44 minutes vs. 56 minutes; however, this was not a significant difference between the groups (*t* - test = NS). Mean scores indicated that the dropouts climbed fewer flights of steps each day and walked fewer blocks on average than the adherents although these differences between the groups were also not significant.

Table 10
Physical Activity Levels Dropouts vs. Adherents

	Dropouts	Adherents
	n = 11	n = 62
Activity	mean ± SD	mean ± SD
Number of Days/Week	3.3 ± 1.4	3.5 ± 1.2
Number of Minutes/Session	43.6 ± 22.0	55.7 ± 27.7
Flights of Steps per Day	7.9 ± 12.2	11.0 ± 13.3
Blocks per Day	9.8 ± 12.5	11.0 ± 13.3

Cardiovascular Indicators

There were no significant cardiovascular health differences between those who completed the study and those who did not (Table 11). Mean differences however indicate that those who dropped out were older and heavier with higher blood pressure.

Table 11

Cardiovascular Health Indicators Dropouts vs. Adherents

Variable	Dropouts n = 19 mean ± SD	Adherents n = 77 mean ± SD
Weight	167.6 ± 24.9	161.5 ± 34.6
Body Mass Index	25.9 ± 3.0	25.4 ± 4.1
Age	32.6 ± 5.7	31.2 ± 7.0
$V0_2$ max	37.1 ± 4.8	37.7 ± 8.6
Systolic Blood Pressure	124.3 ± 13.0	119.5 ± 15.4
Diastolic Blood Pressure	71.2 ± 9.8	69.5 ± 8.8

Control vs. PAMP at Pretest

Demographics

The control group and the PAMP were not significantly different (χ^2 = NS) in military status or rank, gender, education level, race, or smoking status (Table 12). The majority of subjects in the two groups were Caucasian (> 69%) females (> 58%) who were enlisted (> 64%) and on active duty (> 69%). Most had never smoked (> 67%), and had less than an associate's degree (> 63%). Physical characteristics of the two groups such as weight, BMI, and age were not significantly different (*t* = NS) (Table 13), although control group subjects were 14 pounds heavier than those in the PAMP.

Behavioral Mediators

The control group and the PAMP had no significant (*t* = NS) differences in motivation. Differences between the groups were not significant (*t* = NS) for physical activity self-efficacy and the benefits and barriers associated with physical activity. The

PAMP group however tended to have higher mean scores than the control group for physical activity self-efficacy and for the benefits that they associated with being physically active (Table 15).

Table 12

Demographics Control vs. PAMP

Characteristic	Control n = 35 n(%)	PAMP n = 36 n(%)
Gender		
Male	13(37%)	15(42%)
Female	22(63%)	21(58%)
Military Status		
Active Duty	24(69%)	29(81%)
Dependent	11(31%)	7(19%)
Level of Education		
High School	3(16%)	21(27%)
High School/Some College	9(47%)	22(29%)
Associates Degree	4(21%)	5(7%)
Bachelor's Degree	1(5%)	12(16%)
Master's Degree	2(11%)	15(20%)
Professional Degree	-	2(3%)
Military Rank		
Enlisted	25(71%)	23(64%)
Officer	10(29%)	13(36%)
Smoking Status		
Never Smoked	24(69%)	24(67%)
Currently Smoke	3(9%)	4(11%)
Smoked/Quit Prior to Study	7(20%)	8(22%)
Smoked/Quit During Study	1(3%)	-

Table 13 Continued

Demographics Control vs. PAMP

Characteristic	Control n = 35 n(%)	PAMP n = 36 n(%)
Race		
African American	8(23%)	6(17%)
Asian	-	2(6%)
Hispanic	2(6%)	1(3%)
White/Caucasian	24(69%)	27(75%)
Other	1(3%)	-

Table 14

Physical Characteristics Control vs. PAMP

Variable	Control n = 35 mean ± SD	PAMP n = 36 mean ± SD
Weight	168.3 ± 37.0	154.1 ± 30.2
Body Mass Index	25.8 ± 4.5	25.0 ± 3.7
Age	30.4 ± 5.9	31.9 ± 7.8

Table 15

Behavioral Mediators Control vs. PAMP

Characteristic	Control n = 35 mean ± SD	PAMP n = 36 mean ± SD
Physical Activity Self-Efficacy	51.6 ± 20.3	60.2 ± 19.4
Benefits of Physical Activity	94.0 ± 10.6	96.4 ± 10.2
Barriers to Physical Activity	26.6 ± 4.5	27.3 ± 5.9
Benefits - Barriers Total	137.2 ± 12.0	139.0 ± 14.4

Table 16

Stage of Physical Activity Change at Follow-up

Stage of Change	Control n = 35 n(%)	PAMP n = 36 n(%)
Precontemplation/Contemplation	6(17%)	7(19%)
Preparation	10(29%)	6(17%)
Action	8(23%)	11(31%)
Maintenance	11(31%)	12(33%)

Stage of Physical Activity Change

The individuals in both groups were evenly matched with regard to their physical activity stage of change (χ^2 = NS) (Table 16).

Physical Activity Levels

The control group and the PAMP group were not significantly (t = NS) different at in their activity levels (Table 17). Mean score differences between the groups indicated that the control group spent slightly more time per physical activity session than the

PAMP group and they walked more blocks per day. The PAMP group climbed more flights of steps per day.

Table 17

Physical Activity Levels Control vs. PAMP

Activity	Control n = 33 mean ± SD	PAMP n = 31 mean ± SD
Number of Days/Week	3.2 ± 1.5	3.3 ± 1.2
Number of Minutes/Session	45.7 ± 22.0	41.0 ± 22.5
Flights of Steps per Day	6.3 ± 10.4	9.6 ± 14.2
Blocks per Day	10.5 ± 13.0	7.9 ± 8.8

Table 18

Cardiovascular Indicators Control vs. PAMP

Variable	Control n = 35 mean ± SD	PAMP n = 36 mean ± SD
$V0_2$ max	37.5 ± 8.8	38.2 ± 8.5
Systolic Blood Pressure	119.8 ± 16.1	119.5 ± 15.2
Diastolic Blood Pressure	69.1 ± 8.8	70.2 ± 9.0

Cardiovascular Health Indicators

The cardiovascular health indicators peak VO_2 and blood pressure were not significantly different (Table 18) between the groups (t = NS). The groups were actually very evenly matched.

Control vs PAMP Across Time

Research Hypothesis 1

Physical activity behavior changes (confidence, motivation, associated benefits) will be more positive for participants in the Physical Activity Modification Program (PAMP) than among those in the control group at posttest and follow-up.

A 2 group x 3 time RM MANOVA was performed with physical activity self-efficacy and decisional balance as the dependent variables. Motivation was not used due to the large number of subscales and author advice not to combine them into one score. The main effect for time was significant, Wilks's $\lambda = .791$ $F(3,56) = 2.461$, $p < 0.05$, $\eta^2 = .209$, and the main effect for group was significant, Wilks's $\lambda = .871$ $F(3,59) = 2.906$, $p < 0.05$, $\eta^2 = .129$. Interaction effects, however, were not significant in the RM MANOVA Wilks's $\lambda = .974$ $F(3,56) = .246$, $p > 0.05$, $\eta^2 = .026$. The PAMP group had somewhat higher mean scores for physical activity self-efficacy when compared to the control group at pre, posttest and follow-up. The mean scores for benefits associated with physical activity were slightly higher in the PAMP group throughout the study while mean barrier scores were evenly matched. None of these mean differences were significant, however (Table 19).

Research Hypothesis 2 Part A

Those in the PAMP will increase their daily physical activity (caloric expenditure, stairs climbed, blocks walked) more than those in the control group.

A 2 group x 3 time RM MANOVA was performed with flights of stairs climbed per day and blocks walked per day as the dependent variables. Kilocalories of energy expended were not used due to the low response rate for the 7-Day Physical Activity Recalls. The main effects for group and time were not significant and the interaction effect was not significant, Wilks's $\lambda = .991$ $F(4,49) = 1.077$, $p > 0.05$, $\eta^2 = .081$(Table 20).

Research Hypothesis 2 Part B

Those in the PAMP will reach a higher stage of physical activity behavior change at posttest and follow-up than those in the control group.

The Mann-Whitney U test was not significant for movement between the stages of change over time when comparisons were made between the control and PAMP groups. Chi squared tests were significant, however, for movement between the stages for subjects in the control group (pretest to posttest $\chi^2 = 8.6$ and posttest to follow-up $\chi^2 = 14.1$) and for the PAMP (pretest to posttest $\chi^2 = 10.5$, pretest to follow-up $\chi^2 = 10.2$, and posttest to follow-up $\chi^2 = 16.25$) (Table 21).

Research Hypothesis 3

PAMP subjects will improve their cardiovascular health (estimated peak VO_2, blood pressure, resting heart rate) more than subjects in the control group at posttest and follow-up.

A 2 group x 3 time RM MANOVA was performed with peak VO2 and blood pressure as the dependent variables. Resting heart rate was not used due to the low response rate for the 7-Day Physical Activity Recall Questionnaires. The main effect for group and time were not significant and the interaction effects were not significant, Wilks's $\lambda = .917$ $F(6,40) = .607$, $p > 0.05$, $\eta^2 = .083$ in the RM MANOVA (Table 22).

Table 19

Behavioral Mediators Pretest, Posttest, and Follow-up

	Control n = 35			PAMP n = 36		
	Pretest	Posttest	Follow-up	Pretest	Posttest	Follow-up
Variable	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Physical Activity Self-efficacy	51.6 ± 20.3	50.9 ±19.8	51.6 ± 19.1	60.2 ± 19.4	61.0 ± 20.0	59.8 ± 19.2
Benefits of Physical Activity	94.0 ± 10.6	92.6 ± 10.0	93.9 ± 10.5	96.4 ± 10.2	97.4 ± 10.8	96.5 ± 12.0
Barriers to Physical Activity	26.6 ± 4.5	25.6 ± 5.3	26.6 ± 5.3	27.4 ± 5.9	25.9 ± 5.9	26.6 ± 5.3
Benefits + Barriers Total	137.4± 12.0	136.8 ± 13.1	137.9 ± 13.4	139.0 ± 14.4	141.5 ± 14.2	139.9 ± 13.8

Table 20

Physical Activity Levels Pretest, Posttest, and Follow-up

	Control n = 35			PAMP n = 36		
	Pretest	Posttest	Follow-up	Pretest	Posttest	Follow-up
Variable	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Blocks Walked per day	10.5 ± 13.0	11.1 ± 11.0	11.9 ± 10.8	7.9 ± 8.8	9.8 ± 8.1	14.0 ± 11.2
Flights of Steps Climbed per Day	6.3 ± 10.4	7.0 ± 5.2	6.3 ± 4.5	9.6 ± 14.2	7.8 ± 9.2	10.4 ± 17.4

Table 21

Stage of Change Movement Over Time

	Control n = 35			PAMP n = 36		
Stage of Physical Activity Change	Pretest n(%)	Posttest n(%)	Follow-up n(%)	Pretest n(%)	Posttest n(%)	Follow-up n(%)
Precontemplation/ Contemplation	6(17%)	5(14%)	4(11%)	7(19%)	4(11%)	3(8%)
Preparation	10(29%)	7(20%)	7(20%)	6(17%)	5(14%)	6(17%)
Action	8(23%)	5(14%)	5(14%)	11(31%)	8(22%)	5(14%)
Maintenance	11(31%)	18(51%)	19(54%)	12(33%)	19(53%)	22(61%)

* = $p < 0.05$

** = $p < 0.001$

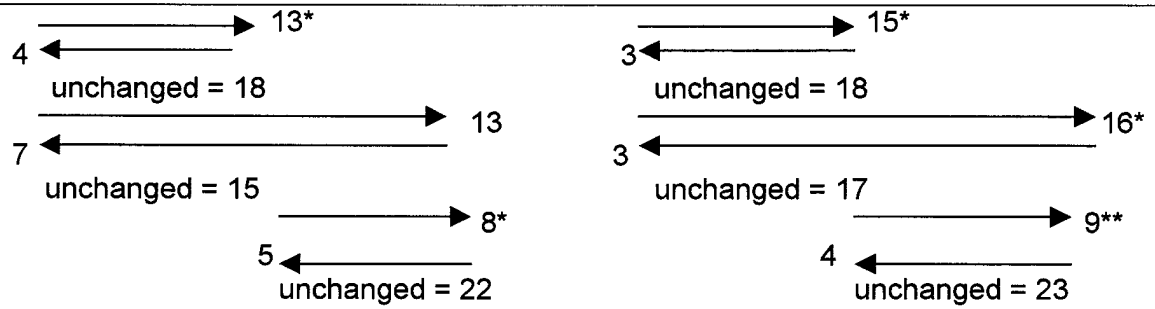

Table 22

Cardiovascular Indicators Pretest, Posttest, and Follow-up

	Control n = 23			PAMP n = 26		
	Pretest	Posttest	Follow-up	Pretest	Posttest	Follow-up
Variable	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Peak VO_2	37.5 ± 8.8	37.4 ± 9.8	35.9 ± 8.9	38.2 ± 8.5	35.9 ± 7.7	36.3 ± 7.5
Systolic Blood Pressure	120 ± 16	126 ± 18	127 ± 12	120 ± 15	124 ± 17	128 ± 17
Diastolic Blood Pressure	69 ± 9	70 ± 10	71 ± 10	70 ± 9	71 ± 12	72 ± 11

Summary

There was very little demographic dissimilarity between those who completed the study and those who did not, or between the control and PAMP groups. All groups remained very evenly matched throughout the study. There were no significant effects found of the intervention on behavioral mediators, physical activity levels or cardiovascular indicators. The most significant finding in the analysis of data for this study was the positive movement from one stage of change to the next in both the control and the PAMP over time.

Chapter V

Discussion

The purpose of this study was to implement a physical activity intervention to effect a change in selected behavioral mediators, levels of physical activity participation, and cardiovascular indicators in a sample of healthy primary care patients under the age of 45. Four self-report measures were used and two physiologic measures were used to assess these changes. The intervention, the Physical Activity Modification Program (PAMP), was based upon constructs from the Transtheoretical Model of Behavior change and it was designed to: 1) be convenient; 2) have low costs; 3) require only modest amounts of effort and time; 4) require no special equipment/facilities; and, 5) require no group meetings or exercise classes.

Very little research has been conducted on how to improve or maintain the cardiovascular wellness of essentially healthy individuals in a primary care setting by attending to their physical activity behavior (Kottke, Brekke, and Solberg 1993). Studies have been conducted with sedentary subjects (Calafas et al., 1996), and older adults (Pinto, Goldstein, DePue, & Milan, 1998a), but research involving individuals under the age of 45 who are perhaps already physically active is scarce. The results of this study provide a starting point for further development of a minimal contact intervention that could be implemented by nurses or other health care providers in the primary care setting.

Recruitment

Initial recruitment of volunteers through the primary care clinic during a three-week period in late May and early June went very well. One hundred and thirty-five individuals indicated that they would participate in the study. Ninety-six of those who originally were recruited for the study were actually pretested. The 39 subjects who did

not pretest either had not completed contact information completely or legibly or could never be contacted, or they failed to keep their pretest appointment. Multiple attempts were made to contact these individuals by mail and telephone but to no avail.

Clinic staff were extremely helpful with all aspects of the study. Approximately half of all individuals approached agreed to be in the study; the most common reason sited by those who declined to participate was a lack of time. Others were excluded because they did not meet the study criteria. The clinic environment proved to be hectic and it lacked the privacy necessary for collection of all the baseline data as originally planned. Subjects were generally in a hurry, which prevented them from completing the initial 7-Day Physical Activity Recall, and resulted in a loss of some of these data.

Adherents vs. Dropouts

Demographics

Many of the differences identified between those who completed the study and those who did not corroborate those of other physical activity studies. One exception to this was gender. The higher dropout rate for females is common in studies involving physical activity, however, the predominance of females remaining in this study was not as common. This may have been a result of the intensity of physical activity stressed in the study. Men are more likely to be interested in vigorous activity while women prefer moderate activity (Sallis, Haskell, Fortmann, et al, 1986). This study focused on increasing low to moderate activity vs. high intensity activity. Another explanation for the large number of females in the study may have been that females were more representative of the population of patients seen in the primary care setting where recruitment occurred.

The reason that those who completed the study were apt to be military dependents versus active duty members was probably a reflection of the perceived time commitment involved. Active duty members did not think they could work the study

requirements into their schedules. Although dependents reported busy schedules, many of them were housewives whose schedules were more flexible. Despite the verbal and written information given to the research volunteers at the time of entry into the study many may have joined the study without a clear idea of what was expected of them. Later they terminated their participation because they felt that the time commitment was more then they could manage. Some loss of subjects also occurred due to incorrect phone numbers and/or addresses making follow-up appointments impossible to schedule.

The higher degree of enlisted member drop out compared to officer dropout was attributed to job type and supports previous research findings. Enlisted personnel often work in blue-collar occupations where workers are more likely to dropout of physical activity programs when compared to white-collar workers, in this case the officers (Oldridge, 1984). Allison and Coburn, 1985 reported that this difference in participation is because many blue-collar workers feel they are active enough at work. The large number of Caucasians in the study supports patterns and trends reported by the Surgeon General. "Physical inactivity is more prevalent among blacks and Hispanics" (U.S. Department of Health and Human Services, 1995). Lower-than-average levels of physical activity participation are frequently reported among African-Americans. (Airhihenbuwa, Kumanyika, Agurs & Lowe, 1995).

Differences in the education level of adherents versus dropouts also supports prior research findings that physical activity adherence is affected by level of education. Those who complete physical activity studies often have more education and are more likely to be interested in physical activity in the first place. (Weinberg & Gould, 1995).

Behavioral Mediators

Study adherents were more motivated than dropouts. While knowledge of and belief in the health benefits of physical activity can motivate initial involvement in

physical activity programs, feelings of enjoyment and well-being are stronger motives for continued participation (Dishman, Sallis and Orenstein, 1985) .

Physical activity self-efficacy, one of the consistently identified determinants of activity participation (Bandura, 1997), was evenly matched between adherents and dropouts. Because perceived self-efficacy is a major influence in forming intentions to be physically active and in maintaining the practice for an extended time, it would not have been unusual if those who dropped out of the study had reported lower physical activity self-efficacy (Dzewaltowski, 1994). Physical activity self-efficacy was not remarkably different between the adherents and dropouts however. This may have been because many of those recruited for the study were already physically active to some degree, which provided them with some physical activity self-efficacy.

The finding that those who completed the study associated more barriers with physical activity than those who dropped out was incongruent with current research. Typically barriers have a negative effect upon intention to be physically active (Dishman, 1994). One explanation for this may be that those who dropped out felt less need to be in the physical activity study because they did not see as many obstacles to being active, while those who remained in the study did so to try to decrease the number of barriers they associated with activity. Higher mean scores on the benefits of physical activity among the adherents were not unexpected. This decision making construct has been shown to be an important determinant of participation in physical activity (Jannis and Mann, 1977).

Physical Activity Levels

Subjects who dropped out tended to be in the earliest stages of change - precontemplation/contemplation - while subjects who remained were in preparation, action, or maintenance. A lack of commitment of participants in the earlier stages of change is not unusual (Prochaska, Norcross & Diclemente, 1994). In fact, a General

Foods corporate fitness study in 1984 found that those who chose to enroll in a physical activity study they did were more physically active than those who chose not to enroll (Roberts, 1992). Dropout rates for persons in the early stages of change are congruent with their lower sense of physical activity self-efficacy and the association of fewer benefits and more barriers with physical activity. The higher mean levels of daily physical activity among those who completed the study also supports their placement into higher stages of change than those who did not complete the study.

Cardiovascular Health Indicators

The finding that subjects who dropped out of the study tended to be heavier and older and to have higher blood pressure than those who remained in the study was not atypical. Obesity is a commonly identified personal characteristic directly related to increased dropout from physical activity programs (Robison & Rogers, 1994). Being over weight can pose special challenges for those trying to become more physically active. This group of individuals may drop out of programs to increase physical activity because they find the activity difficult, painful or fatiguing or it makes them feel inadequate or self conscious (Dishman, 1994). In contrast to the physiological characteristics of the dropouts in this study, a study conducted at the University of Minnesota found that people in poorer health who perceive themselves to be more susceptible to coronary heart disease are more likely to participate in physical activity programs (Mirotznik, Speedling, Stein & Bronz, 1985).

Control vs. PAMP

The demographic similarities as well as similarities in behavioral attributes, physical activity levels, physical activity stages, and cardiovascular health indicators between the control group and the PAMP significantly decreased selection threats to this study. Minimizing selection threats can enhance intervention effects. Random assignment was a major strength of the study as group equivalence throughout the

experiment enabled the comparison between groups to be as unbiased as possible (Cook and Campbell, 1979).

The overall findings of this study and the three research hypotheses probably were inconclusive in part due to a lack of power. This lack of power could be attributed to several problems. First, an insufficient sample size was a problem due to the large loss of subjects in the early stages of the study. Second, within group variability (males and females in the same group, large age range) may have affected the power. Third, the short duration of the treatment is another potential threat to power because of its impact on the effect size. Because of low power in this study it is difficult to interpret some of the data. It may be that the intervention made a difference but there was poor power for detecting the difference.

Research Hypothesis 1

The hypothesis that physical activity behavior changes would be more positive for those in the PAMP than those in the control group was not supported by this study. Lack of significant differences between the groups on the constellation of behavioral mediators might be attributed to the similarity of information and assistance received by both groups. This similarity may have sacrificed power by not maximizing the difference in the treatment of the two groups. Researchers are advised to maximize group differences on the dependent variable of interest by maximizing the differences on the independent variable. Treatments should be as distinct and strong as money, ethics and practicality permit (Polit and Hungler, 1991).

A second possible explanation for these results may have been because subjects became conditioned to particular responses on the questionnaires from previous testing. The measures used were fairly short and it would not have been difficult to remember from one session to the next which answer had been given. Length of time of the study may also have affected study results. Behavior change is a very time

dependent variable and four months may not have been a long enough time to effect significant changes in behavior.

The PAMP attempted to effect a change in physical activity self-efficacy through the four dimensions of self-efficacy as described by Bandura, performance attainment, vicarious experience, verbal persuasion and emotional arousal (Bandura, 1997). Each of these dimensions was addressed in a manner commensurate with the individual's identified stage of change. The PAMP relied to a large extent on written information to build confidence in the subject's ability to be successful and persistent in physical activity. Reminders about starting with small manageable goals allowed individuals to feel successful with their physical activity behavior, a key component to increased feelings of physical activity self-efficacy. All progress no matter how small it might have seemed to the subject was praised. If the individual was unable to be physically active on a consistent basis they were reminded to take one day at a time and not to let past behavior predict their future behavior.

The PAMP guided subjects through goal setting challenging them to greater self-discovery and action. It provided positive verbal and written reinforcement (phone calls for encouragement, e-mail, postcards and letters) as well as reinforcement through incentives such as T-shirts, gym bags and water bottles. It also provided role modeling, and technical assistance through information about the availability of exercise facilities. Although there were no significant changes in all behavioral mediators considered at once there were trends toward an increase in the benefits subjects associated with physical activity. Written exercises prompted subjects to identify the ways that physical activity made them feel better, helped them to see more benefits to physical activity, and to value the benefits above the costs. These insights facilitated movement from one stage of change to the next and increased the likelihood that subjects would participate in physical activity. These results support previous research of Prochaska and

DiClemente regarding decisional balance and movement through the stages of change (Glanz, et al, 1997).

There are several reasons the PAMP and control groups may not have differed from pretest to posttest with respect to self-efficacy and benefits. One problem may have been that, though minimal, the information the control group received during the study aided them more than originally anticipated. A second problem can be attributed to an increased awareness or attention to physical activity in both groups as a result of their participation in the study, and a third reason for a lack of difference between the groups may have been due to compensatory rivalry, which motivated control group subjects to improve despite not receiving the same intervention. A final reason that the PAMP and control groups may not have differed with respect to self-efficacy and benefits was that as individuals in both groups moved from one stage of change to the next, they also increased their physical activity self-efficacy and the number of benefits they associated with activity. This left no differences between the groups. Differences between the groups would only have been more apparent if the groups had not progressed through the stages of change at the same rate.

The minimal decrease in the number of barriers both groups associated with physical activity over the course of the study was a disappointing finding but not a surprising one due to the lack of control over the environment. Written exercises were used to assist subjects to identify barriers to physical activity and then to list possible courses of action to avoid these barriers. However, these written exercises may not have been strong enough to counteract strong barriers such as a lack of time, seasonal changes, and perceived inconvenience. The number one reason cited by subjects for not engaging in physical activity was a lack of time. This supports other studies that cite time as a common barrier (Robison and Rogers, 1994). The PAMP attempted to offset this by encouraging subjects to incorporate activity into their daily routines (i.e. take the

steps and not the elevator, park further away in the parking lot and walk). This may have helped the subjects to increase their daily activity but it did not alter their perception of time as a barrier. Another negative impact on changing barrier perceptions was that the study progressed from the summer into the fall and winter. Inclement weather often interferes with levels of physical activity. Previous survey results report individual physically activity is substantially lower in the winter than in the summer (U.S. Department of Health and Human Services).

The dependent variable, motivation, was not used in multivariate analysis as originally planned because of the large number of subscales in the measure and the inadvisability of combining the scores into one total score. D. Markland, who developed the questionnaire stated, " I don't really think that it is appropriate to just add up all the subscale scores. The way I see it, the EMI-2 is designed to tap the direction of motivation rather than the intensity, although there's obviously some element of intensity of direction; it taps the extent to which a respondent is motivated to exercise for various distinct reasons rather than just HOW motivated to exercise they are." There were notable positive trends identified in the PAMP group during this study however.

The intervention in this study attempted to build on motivating factors by using both intrinsic and extrinsic motivational approaches. Motivational encouragement was provided to the intervention group through verbal and nonverbal coaching. Building on the individuals' intrinsic motivation by encouraging them to perceive themselves as the originators of their physical activity behavior was key. Motivation from within in most cases is more enduring than motivation from without. This is consistent with the literature that reports improved motivation when the stimulus becomes a part of the person's identity rather than something external to them (Biddle, 1995). Building intrinsic motivation set this intervention apart from many others that rely on extrinsic motivators such as group exercise classes. Intrinsic motivation allowed the subjects to feel in

control, which is a central element in adopting a more physically active lifestyle and in sticking to it (Jonas, 1995). By increasing motivation of individuals have a better chance of continuing with their physical activity. Motivation data from this study highlights the fact that persons may be motivated to participate in physical activity programs for a variety of reasons. Therefore, when promoting participation the focus should be diverse and take a variety of motives into account (Heinzelmann & Bagley, 1970).

Research Hypothesis 2 Part A

The second research hypothesis, that PAMP group members would increase their daily physical activity more than control group members was not supported. There was no significant difference in progression through the stages of change between the two study groups. However, over time, each group did record significant movement from one stage of change to the next. The positive movement through the stages of change that both groups made undermined any group differences. Like movement of control group subjects and PAMP subjects through the stages of change may have resulted from the similarities in group management during the study. Parallels between the groups included increased attention, and receipt of similar baseline knowledge about the importance of physical activity. Upon final analysis there may have been an inadequate number of treatment differences between the groups to differentiate them. This study did extend the current literature supporting the construct validity of the Transtheoretical Model and physical activity change. There were differences in the magnitude of qualities possessed by participants such as physical activity self-efficacy, motivation, and benefits associated with physical activity, at the various stages of change.

Research Hypothesis 2 Part B

Despite progression through the stages of change for physical activity there was not a corresponding change in physical activity levels of persons in either group. This

could be attributed to physical activity levels that were unaffected by the intervention, or to measurement difficulties. The focus of the PAMP was to change mediators to physical activity, and this in turn was intended to translate into a change in physical activity levels. The short duration of the study, and seasonal effects may also have negated increases in both behavioral mediators and levels of physical activity. As winter approached and with it the hectic holiday season, many subjects reported decreased physical activity. They felt that there was less opportunity to be outdoors and less time to devote to physical activity.

Another reason that variation in physical activity levels may not have been detected can be ascribed to measurement errors and loss of data. Physical activity levels for this study were to be based on the 7-Day Physical Activity Recall. This measure was chosen because of its proven validity and its sensitivity to the effects of physical activity promotion programs (Sallis, Buono, Roby & Nelson, 1990). Subjects who completed their activity recall booklets provided valuable information to the study. Unfortunately, many of the 7-Day Recalls were not returned. In spite of multiple reminders and verification with the participants that they understood what was expected of them, there was insufficient response for analysis. Asking subjects to record daily activity over a 7-day period may have been too demanding. This was unfortunate because self-monitoring can be a useful first step in initiating change by helping subjects gain self-understanding and recognize their own behavior patterns (Damrosch, 1991).

The physical activity data that were used, days per week of physical activity, minutes per session, flights of steps climbed and number of blocks walked, was not detailed enough to allow for a detection of change. In addition, the use of self-report may not have accurately captured the subjects true level of physical activity, to include time spent, distance traveled and effort put forth. Validity, or accuracy, of measures is a key issue in the assessment of physical activity levels. Although self-report measures

can contain considerable error, they are still useful in indicating which people are more or less active (Sallis & Owen, 1999). An instrument such as the Caltrac may have provided a more objective measure of the time spent in moderate and vigorous intensity activity. Ideally one would like the most accurate assessment of activity, however, increasing the accuracy of instruments typically involves increased demands on subjects and can actually alter usual behavior (Laporte, Montoye & Caspersen, 1985).

Research Hypothesis 3

The final hypothesis, that PAMP subjects would improve their cardiovascular health more than subjects in the control group was not supported by this study. The short duration of the study and the lack of intensity of the physical activity behavior are two likely reasons that there was no significant difference between the control and the PAMP on the cluster of dependent physiological variables, peak VO_2, systolic blood pressure, and diastolic blood pressure. Resting heart rate could not be used because of the poor response rate in both groups. Heart rate data were insufficient for the analysis.

The PAMP was focused on increasing daily physical activity and not on increasing aerobic power. This finding supports previous research findings that aerobic power is more closely associated with cardiovascular changes than simply increasing physical activity levels (McMurray, Ainsworth, Harrell, Griggs, & Dale, 1998). Cardiorespiratory fitness measures reflect almost exclusively heavy intensity activity and not low to moderate activity (Jacobs, Ainsworth, Hartman and Leon, 1992). Although high intensity activities show a stronger association with beneficial levels of coronary risk factors than low intensity activities, lower intensity activities conducted frequently may contribute to cardiovascular fitness in general (Mensink, Heerstrass, Neppelenbroek, Schuit & Bellach, 1997). Another possible reason for a lack of significant difference can be explained by the dose response curve. Many of the people who entered this study were already active, making increased benefits of physical activity harder to detect since

benefits are most significant when an individual goes from low activity to higher activity. Many participants in this study were already active and benefits taper off for more active people. A third ground for insignificance is the possibility that the subjects were unaffected by the intervention and that they did not increase their activity. The significant findings of a higher diastolic blood pressure in the control group and a higher systolic blood pressure and lower peak VO_2 in the intervention group was in part due to the time period over which the study occurred. The study began in the summer, a time of more physical activity and proceeded into the winter, a time of more sedentary behavior as well as more stress. Many participants stated that they were actually less active and had gained weight over the holidays. This decrease in activity and increased stress was evidenced by the significant increase in diastolic and systolic blood pressure in the control and intervention groups' respectively and the lower aerobic capacity in the intervention group.

The extremely low prevalence rate of smoking among all subjects in the study eliminated the likelihood that this would confound physiological data. One study participant quit smoking during the study and increased her peak VO_2 by 8 ml/kg/min. Even one day of abstinence can reverse the increased oxygen cost of breathing caused by cigarette smoke. Following 15 puffs on a cigarette during a 5-minute period, airway resistance can increase as much as three-fold; this added resistance to breathing lasts as average of 35 minutes and increases the oxygen cost of breathing (McArdle, Katch & Katch, 1991).

Study Limitations

The most critical limitation of this study was the sample size and its effect on power. Poor response rates on the 7-Day Physical Activity Recall, including resting heart rate calculations were a major limitation because this data were than lost to analysis. Seasonal variations in physical activity and the short time period of study

decreased the likelihood of finding significant increases in physical activity. Use of the bicycle ergometry test was also limiting because those subjects who were not experienced cyclists or those who had low achievement motivation for the task may have performed in a manner that underestimated their true peak VO_2. Expectations that aerobic capacity would change within a four month time frame in a group of moderately active subjects was an additional limitation. Use of the bicycle ergometry test may also have been a limitation because of the potentially negative connotations associated with the test. Failure can result in termination of military service. Some individuals may not have performed well due to fear of failure.

The number of people available to implement the PAMP was also limiting because of the time demands necessary to follow-up with individual subjects. Another limitation may have been associated with the determination of whether the intervention was received. All participants in the PAMP were asked at the completion of the study to indicate the percentage of study material that they read. Over three-fourths of them indicated that they had read at least 50% of the material. Although reading the material is one indicator of receipt of the intervention, comprehension of the material should also be assessed. Another limitation of this study was the absence of a "true" control group. The similarity in treatment of the two groups may have sacrificed power by not maximizing the difference between the two groups. Researchers are advised to maximize group differences on the dependent variable of interest by maximizing the differences on the independent variable. It could also be argued that significant changes in behavior or stage of change were the result of the increased attention given to both groups in the study. This Hawthorne effect is the effect on the dependent variable caused by subject's awareness that they are participants under study (Cook & Campbell, 1979).

Recommendations for Future Research

Future studies must carefully address issues of power. This can be accomplished by: oversampling to ensure sample size will be adequate, considering a more lenient alpa, using one-tailed tests if possible, try decreasing within group variability (have groups that are all female or male, more similar in age), using repeated measures to remove individual differences, and ensuring the treatment is of long enough duration to produce a large effect size (Stevens, 1996). There should also be components to help participants refute subjective beliefs about barriers to physical activity or at least to think about them less often because barriers to physical activity are a major determinant of whether or not a person is active. Address objective environmental barriers and ways in which these can be changed (Sallis & Owen, 1999). Barriers to physical activity may even need to be addressed on an individual basis. It could be worthwhile to differentiate between contrived barriers (excuses) and the discovery of actual barriers that require solutions (Huddy, Herbert, Hyner & Johnson, 1995).

There is a need to incorporate a validation of self-report measures of physical activity into future studies. Using a Caltrac activity monitor to assess frequency and duration of physical activity could accomplish this, while the use of heart rate monitors could assess intensity. Some people find it very difficult to estimate the intensity and frequency of low to moderate intensity activities, making the Caltrac and heart rate monitors very useful. Technological advances in the past few years make these devices easy to use. The Internet and electronic mail could also be useful for the collection of physical activity data from participants. Electronic transmittal of data could cut down on the cost of postage and it could expedite data retrieval.

Collecting more demographic data at the beginning of the study and validating contact information also are imperative. It is also advisable to have a quiet room set aside for initial screening and interviews of potential participants. Other studies should

target physical activity programs to subgroups that seem to participate less in physical activity (African-Americans, blue-collar workers, men, those overweight and younger with less education). This would add to the generalizability of the research findings. It would also be ideal to have the study extended to at least a year and to include other measures of cardiovascular health such as relevant laboratory indices. Aerobic capacity should be reconsidered as a measure with low to moderate levels of physical activity especially if the study is of short duration.

A final recommendation is to incorporate a third group, a true control group, into the study. This group would receive no additional attention. Clinical research can be influenced by many factors that are capable of invalidating results, and one of these is the Hawthorne effect (De Amici, Klersy, Ramajoli, Brustia & Politi, 2000).

Nursing Considerations

Nursing is able to cast into almost every realm of human life to assist individuals to effect changes not only in their behavior, but also in their physiology and their environment. This study is multifaceted and incorporates all three of these parameters into a template that has the potential to effect and support the physical activity habits of a great number of people. Nurses are encouraged to be catalysts to creating an environment within primary care, which promotes physical activity and then by applying the principles of behavioral change to guide patients toward improving their own cardiovascular health.

To incorporate physical activity interventions into practice nurses must continue pursuit of knowledge that will increase client participation and client responsibility for health. Nurse's may be able to develop and use client-centered programs using the Transtheoretical Model to effectively impact physical activity behavior. Programs such as this may help the client to increase their own personal responsibility for their health and support the goals of Healthy People 2010 (Healthy People 2010, 2000).

Physical activity counseling remains an important area of research and practice in primary care because of the potential impact of health benefits that wide adoption of active lifestyles can have on the American public. Primary health care providers can play a crucial role in developing and testing physical-activity counseling strategies, changing social norms about physical activity, creating environments that encourage active lifestyles, and helping patients gain skills to remain optimally active throughout their lives (Dishman, 1994). In addition to the impact that nurses' attention to physical activity can have on cardiovascular health, it also may be an effective way for nurses to impact rising health care costs. By implementing effective interventions that assist people to change unhealthy behaviors such as inactivity, more patients may be kept out of the health care system thereby decreasing cost (Damrosch, 1991).

With 80% of the US population seen in the Primary Care setting each year, the opportunity for nurses and other health care providers to discuss physical activity with patients is tremendous (Woolfe et al, 1996). This study lays a foundation for nurses to think about initiating a stage-matched physical activity intervention to assist patients to adopt and maintain a more physically active lifestyle; and it does so by using a realistic intervention that is convenient, low cost both in time and money and requires no special facilities and no group exercise classes.

Summary

Low post hoc power in this study makes it difficult to draw valid conclusions. However, trends toward positive changes in behavior and movement to higher stages of change that occurred are encouraging. The lack of change in cardiovascular indicators, most likely due to the short time period of the study and the measurement indices used, requires further investigation. Measurement of physical activity levels also is an area of concern. With some changes, especially more adequate sample size, future studies could be more powerful. There are many potential strategies to explore that may be

effective in helping others begin to incorporate more physical activity into their health regimens. Individuals need to incorporate regular physical activity into their lives on a daily basis but should realize that even some physical activity, even if not performed regularly, is much better than being sedentary (Andersen, Wadden, Bartlett, Zemel, Verde, and Franckowiak, 1999).

Existing data now suggest that the largest improvement in cardiovascular fitness is associated with progression from the lowest to the next higher level of physical activity. This is encouraging for interventions such as PAMP that advocate everyday lifestyle activities such as walking, cycling, stair climbing, and gardening rather than enrollment in costly, structured programs of aerobic exercise (Leon, 1997).

Helping patients to increase their level of physical activity in a population where more than 60% of US adults are not regularly physically active and 25% are not active at all (US Department of Health and Human Services, 1996) may ease the burden of demand on an overcrowded health care system. Improved cardiovascular fitness has the potential to reduce or even eliminate the need for costly measures such as surgery or medication, two common palliative treatments for damage to the cardiovascular system attributable in part to a lack of regular physical activity. Nurses can lead the way as advocates of physical activity behavior, as role models, and as change agents in the incorporation of physical activity interventions into primary health care settings. With Americans averaging 2.7 office visits per person per year to health care providers, and with 60% of these visits occurring in primary care there is an opportunity to influence the cardiovascular fitness of many patients (Patrick et al., 1994). Intervening early to assist patients to become more physically active can contribute significantly to a reduction in the relative risk for the development of cardiovascular disease.

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Appendix A

Modified Physical Activity Readiness Questionnaire PAR-Q

MEDICAL RECORD	PROGRESS NOTES
DATE	**Modified Physical Activity Readiness Questionnaire PAR-Q**
	PAR-Q is designed to help you help yourself. Many Health benefits are associated with regular physical activity, and the completion of PAR-Q is a sensible first step to take if you are planning to increase the
	amount of physical activity in your life. For most people physical activitity should not pose any problem or hazard, PAR-Q has been designed to
	identify the small number of adults for whom physical activity might be inappropriate or those who should have medical advice concerning the type of activity most suitable for them. Common sense is your best
	guide to answering these few questions. Please read them carefully and circle YES or NO opposite the question if it applies to you. Once you have completed the PAR-Q give it to your health care provider.
	Yes No 1. Has your doctor ever said you had heart trouble?
	Yes No 2. Do you frequently have pains in your heart and chest?
	Yes No 3. Do you often feel faint or have spells of severe dizziness?
	Yes No 4. Has a doctor ever said your blood pressure was too high?
	Yes No 5. Has your doctor ever told you that you have a bone or joint problem such as arthritis that has been aggravated by physical activity or might be made worse by physical activity?
	Yes No 6. Is there a good physical reason not mentioned here why you should not follow an activity program even if you wanted to?
	Yes No 7. Are you over the age of 65 and not accustomed to vigorous exercise?
	Yes No 8. Are you pregnant or think you may be pregnant?
	Yes No 9. Are you taking any medication, either from a health care provider or over the counter, on a regular basis that you believe may affect your heart rate or your ability to
	increase your physical activity?
	DO NOT WRITE BELOW THIS LINE
	Providers please circle is or is not and place PAR-Q in record
	This patient IS IS NOT medically able to have a fitness assessment and participate in a program of increased physical activity.
	Providers signature Date
	Female patients who are uncertain of pregnancy status should be tested prior to entering the study
	(Continue on reverse side)

PATIENT'S IDENTIFICATION (For typed or written entries give: Name - last, first, middle; grade; rank; rate; hospital or medical facility)	REGISTER NO.	WARD NO.

PROGRESS NOTES
Medical Record

STANDARD FORM 509 (REV. 7-91) (EG)
Prescribed by GSA/ICMR, FIRMR (41 CFR) 201-9.202-1
Designed using Perform Pro, WHS/DIOR, Jul 94

Appendix B

Procedures Manual

Procedures for this study occurred in five parts: 1) specifies procedures for participant selection, 2) describes the plan for initial participant contact on the day of their clinic appointment, 3) defines the process to be followed during each of the data collection times, 4) describes counseling procedures during telephone contact.

I) Preparation for Initial Clinic Visit 1-4 Weeks Prior to Scheduled Appointment

A. Obtain a clinic appointment list through the Composite Health Care System (CHCS) for the following 1-4 weeks. CHCS is an automated system used by the military for appointments, laboratory and radiology data, as well as patient records.

B. From the patient appointment list exclude subjects who are being seen for an acute problem such as sore throat, fever, nausea/vomiting, and etc.

C. Attempt to screen the remaining participants from #2 above through the automated patient record in CHCS. If data is not available through CHCS attempt to obtain outpatient records for these participants to screen for exclusion criteria. Excluded individuals will be deleted from the participant list. If the outpatient record is not available screening will be completed at the scheduled visit.

D. Once the participant list has been finalized individuals will be randomized into the control group (exercise prescription) or intervention (PAMP) group. The group the patient is randomized to will be annotated beside their name on the appointment list. The letter *A* will denote randomization to the standard care group and *B* will denote randomization to the PAMP.

II) Day of Scheduled Appointment, All Eligible Participants

A. Prior to the start of business on the day of the scheduled appointments, provide the list of eligible study participants to the clerk in the clinic. Each eligible patient will have an Information Sheet with his or her name on it at the check-in desk (see Attachment 1 for this information sheet).

B. When an eligible study participant presents to check-in, the clerk will:

1. Determine military eligibility for care, if the individual is not eligible for military care they cannot be included in the study.
2. Provide the patient with the Information Sheet for the Physical Activity Modification Program and ask them to read this while they wait to have their vital signs assessed.
3. At the time the patient has his/her vital signs assessed the medical technician will ask them if they were able to read the "Information Sheet" while they were waiting, and if they would be interested in participating in the study. If the patient has read the information and declines to participate, the medical technician thanks them. If the patient did not have a chance to read the information sheet the medical technician should briefly explain it and ask the patient if he or she is interested in being a part of the research project.
4. For those individuals who indicate they are interested in being in the study the medical technician will ask if he/she expects to remain in the local area for the next 8 months. If the individual will be in the area they may continue as a participant, if not, the medical technician will explain to them that the project will be taking place over the course of the next 8 months and

therefore they would be unable to complete it. The technician will thank the individual for their interest in the project.

5. Individuals who remain eligible at this point will complete the modified PAR-Q (Appendix A) and the Stages of Change Questionnaire (SCQ), (see Appendix F for the SCQ) while they wait to see their provider.

C. When the patient is escorted to the provider's office the medical technician will collect the SCQ and he or she will ensure that the patient has completed the PAR-Q form and that it is visible in the medical record.

1. Providers will determine whether the patient is medically fit to participate in the PAMP study and will sign the PAR-Q circling the appropriate choice **IS**, or **IS NOT**.
2. Once the patient leaves the providers exam room the medical technician will obtain the PAR-Q from the medical record and determine whether the provider thought the patient could be in the PAMP or not.
   (a) Patients who were not advised to increase their physical activity will be thanked for their interest, and told that their provider does not recommend increased physical activity for them at this time. If they have further concerns they will be instructed to follow-up with their provider.
   (b) Patients who are medically cleared to continue in the PAMP will then be scheduled for aerobics testing sometime during the next two weeks. They will receive the following:
   - An Aerobic Testing Instruction Sheet (see Attachment 2 for these instructions),
   - A card with the investigators name, phone number and e-mail address.
   - A Resting Pulse Rate Instruction Sheet (see Appendix H for these instructions)
   - Verbal instructions about taking a resting heart rate.
   - A consent form that they will be asked to read and to sign (see Attachment 3 for the consent form).

D. This completes appointment day activities

III) Data Collection Procedures

A. Data Collection Time 1, All Participants

1. Two participants will be scheduled at 45-minute intervals for estimated peak VO_2 max testing. While one participant is being tested on the cycle ergometer the other participant will complete the Self-Efficacy for Behavior Scale [SEEBS], (2) Exercise Motivation Inventory-2, (3) Exercise Benefits/Barriers Scale, and the 7-Day Physical Activity Recall.
2. Once the cycle ergometer testing is complete each participant will receive either an exercise prescription or they will be instructed on a PAMP stage matched intervention. These discussions will be private. Each participant will be asked not to discuss his or her personal program with anyone else in the study.

(a) Control group participants will each receive:
- An exercise prescription, (see Attachment 4 for the exercise prescription), this will be completed once the subject has completed the cycle ergometry test.
- The following pamphlets: "Exercise Your Heart", "Walking for a Healthy Heart", and "Just Move".
- Safety Instructions (see Attachment 5 for safety instructions).
- A Fitness Profile Summary Report (see Attachment 6 for the summary report).

(b) PAMP participants will receive:
- The Living with Exercise Manual (Blair, 1991).
- Specific written instructions based on his/her identified stage of change (see Attachment 7a-7e for the five staged instruction sheets).
- Safety Instructions
- A Fitness Profile Summary Report

3. All participants will be tentatively scheduled for their next cycle ergometer test prior to leaving this data collection session.

B. Data Collection Time 2, All Participants – 16 weeks from Initial estimated peak VO_2. Testing
1. Two subjects will be scheduled at 45-minute intervals for estimated peak VO_2 testing. While one participant is being tested on the cycle ergometer the other participant will complete the SEEBS, (2) Exercise Motivation Inventory-2, (3) Exercise Benefits/Barriers Scale, the 7-Day Physical Activity Recall, and the SCQ.
2. Once the cycle ergometer testing is complete each participant will be asked what he or she thought about the physical activity program. All will receive an updated Fitness Summary Profile Report. Specifically those in the PAMP will be asked what they thought about the Living with Exercise program, and whether it helped them become more active. Post-intervention recommendations with this group of participants will be oriented to the stage of change they are in (see Attachment 8 for counseling techniques recommended for each stage of change). Those subjects in the standard care group will be asked questions that imply interest without coaching (see Attachment 8). These discussions will be private. Each participant will be asked not to discuss his or her personal program with anyone else in the study.
3. All participants will be tentatively scheduled for their final cycle ergometer test prior to leaving this session.

C. Data Collection Time 3, All Participants – 32 Weeks after Initial estimated peak VO_2 testing
1. Two participants will be scheduled at 45-minute intervals estimated peak VO_2 testing. While one participant is being tested on the cycle ergometer the other participant will complete (1) SEEBS, (2) Exercise Motivation Inventory-2,(3)Exercise Benefits/ Barriers Scale, the 7-Day Physical Activity Recall, and the SCQ.
2. Once the cycle ergometer testing is complete each participant will have a 15-minute discussion with one of the investigators. The final meeting with the participants will be to thank them for their participation in the project (each will

receive a T-Shirt). All subjects will also receive a final Fitness Summary Profile.

IV) Telephone Contact/Counseling Content

A. Precontemplators

1. Telephone contact 1 of 2 - three weeks from initial estimated peak VO_2 testing

Participants in this group will be called to find out how they are doing in their thought processes regarding an increase in their physical activity. Positive reinforcement will be offered, and any questions will be answered. Appropriate counseling techniques will be used (see Attachment 8). If the participant appears ready to move onto the next stage of change he/she will be provided with the appropriate assignments from the Living with Exercise Manual (i.e., assignment for contemplators, Chapter 2 pg. 31-50). The participant will also be mailed the modified Stage of Change Instructions (see Attachment 9a for this instruction sheet).

2. Telephone Contact 2 of 2 - twelve weeks from initial estimated peak VO_2 testing

Participants in this group will be called to find out how they are doing in their thought processes regarding an increase in their physical activity. Positive reinforcement will be offered, and any questions the participant has will be answered. Appropriate counseling techniques will be used (see Attachment 8). If the participant appears ready to move onto the next stage of change he/she will be provided with the appropriate assignments from the Living with Exercise Manual (i.e., assignment for contemplators, Chapter 2 pg. 31-50). The participant will also be mailed the modified Stage of Change Instructions (see Attachment 9a for this instruction sheet).

B. Contemplators/Preparers

1. Telephone contact 1 of 3 – two weeks from date of initial estimated peak VO_2 testing

Participants will be called and asked whether they are getting ready to increase the amount of physical activity in their daily lives. Appropriate counseling techniques will be used (see Attachment 8). Participants should be offered positive reinforcement, and any questions the person might have should be answered. If the participant is in contemplation and appears ready to move to preparation he/she will be provided with the appropriate assignments from the Living with Exercise Manual (i.e., Chapter 3 pg. 51-64). The participant will also be mailed the modified Stage of Change Instructions (see Attachment 9b for this mail out instruction sheet). If the participant is in preparation and appears ready to move to action provide them with the appropriate assignments from the Living with Exercise Manual (i.e., Chapter 4 "Making Progress" pages 64-72, Chapter 7 "Keep It Up" pages 91-98). The participant will also be mailed the modified Stage of Change Instructions (see Attachment 9c for this mail out instruction sheet). Preparers moving to action will also receive a copy of the Classification by Energy Cost of Human Physical Activities (see Attachment 10 for this classification), an exercise prescription and a physical activity contract (see Attachment 11 for a copy of this contract) to complete and return by mail.

2. Telephone contact 2 of 3 - ten weeks from date of initial estimated peak VO_2 testing

Participants in this group will be called and asked whether they are getting ready to increase the amount of physical activity in their daily lives. Appropriate counseling techniques will be used (see Attachment 8). Participants should be offered positive reinforcement, and any questions the person might have should be answered. If the participant is in contemplation and appears ready to move to preparation he/she will be provided with the appropriate assignments from the Living with Exercise Manual (i.e., Chapter 3 pg. 51-64). The participant will also be mailed the modified Stage of Change Instructions (see Attachment 9b for this mail out instruction sheet). If the participant is in preparation and appears ready to move to action he/she will be provided with the appropriate assignments from the Living with Exercise Manual (i.e., Chapter 4 "Making Progress" pages 64-72, Chapter 7 "Keep It Up" pages 91-98). The participants will also be mailed the modified Stage of Change Instructions (see Attachment 9c for this mail out instruction sheet). Preparers moving to action will also receive a copy of the Classification by Energy Cost of Human Physical Activities, an exercise prescription and a physical activity contract to complete and return by mail.

3. Telephone contact 3 of 3 - fourteen weeks from date of initial estimated peak VO_2 testing.

   Participants in this group will be called and asked whether they are getting ready to increase the amount of physical activity in their daily lives. Appropriate counseling techniques will be used (see Attachment 8). Participants should be offered positive reinforcement, and any questions the person might have should be answered. If the participant is in contemplation and appears ready to move to preparation he/she will be provided with the appropriate assignments from the Living with Exercise Manual (i.e., Chapter 3 pg. 51-64). The participant will also be mailed the modified Stage of Change Instructions (see Attachment 9b for this mail out instruction sheet). If the participant is in preparation and appears ready to move to action they will be provided with the appropriate assignments from the Living with Exercise Manual (i.e., Chapter 4 "Making Progress" pages 64-72, Chapter 7 "Keep It Up" pages 91-98). The participants will also be mailed the modified Stage of Change Instructions (see Attachment 9c for this mail out instruction sheet). Preparers moving to action will also receive a copy of the Classification by Energy Cost of Human Physical Activities, an exercise prescription and a physical activity contract to complete and return by mail.

C. Action/Maintainance

1. Telephone contact 1 of 2 - three weeks from date of initial estimated peak VO_2 testing

   Participants will be called and asked how they are doing in increasing or maintaining their physical activity level. They will be offered positive reinforcement and any questions the participant has will be answered. Appropriate counseling techniques will be used (see Attachment 8). If the participant is in the action stage and appears ready to move to the next stage of change he/she will be provided with the appropriate assignment from the Living with Exercise Manual (i.e., assignment for maintanance Chapter 9 "The Final Touch" pages 105-110). These participants will also be mailed the modified Stage of Change Instructions (see Attachment 9d

for this instruction sheet). If the participant is in the maintenance stage the he/she will be offered appropriate counseling per Attachment 8.

2. Telephone contact 2 of 2 - twelve weeks from date of initial estimated peak VO_2 testing

   Participants will be called and asked how they are doing in increasing or maintaining their physical activity level. They will be offered positive reinforcement and any questions the participant has will be answered. Appropriate counseling techniques will be used (see Attachment 8). If the participant is in the action stage and appears ready to move to the next stage of change he/she will be provided with the appropriate assignment from the Living with Exercise Manual (i.e., assignment for maintenance Chapter 9 "The Final Touch" pages 105-110). These participants will also be mailed the modified Stage of Change Instructions (see Attachment 9d for this instruction sheet). If the participant is in the maintenance stage he/she will be offered appropriate counseling per Attachment 8.

V) Mailing Content

A. Precontemplators/Contemplators
   1. Mailing 1 of 4 - six weeks after initial estimated peak VO_2 testing
      (a) AHA pamphlet "Exercise Your Heart"
      (b) AHA pamphlet "Just Move"
      (c) Handwritten positive reinforcement message
   2. Mailing 2 of 4 – eight weeks after initial estimated peak VO_2 testing
      (a) AHA pamphlet "Steps to a Healthier Heart"
      (b) AHA pamphlet "Walking for a Healthier Heart"
      (c) Postcard reminder of next testing date/time and RHR reminder
      (d) Positive reinforcement note, handwritten.
   3. Mailing 3 of 4 - fourteen weeks after initial estimated peak VO_2 testing
      (a) Postcard reminder of next testing date/time and RHR

B. Preparation
   1. Mailing 1 of 5 - three weeks after initial estimated peak VO_2 testing
      (a) AHA pamphlet "Exercise Your Heart"
      (b) AHA pamphlet "Just Move"
      (c) Handwritten positive reinforcement message
   2. Mailing 2 of 5 - six weeks after initial estimated peak VO_2 testing
      (a) AHA pamphlet "Steps to a Healthier Heart"
      (b) AHA pamphlet "Walking for a Healthier Heart"
      (c) Handwritten positive reinforcement message
   3. Mailing 3 of 5 – six weeks after initial estimated peak VO_2 testing
      (a) Handwritten positive reinforcement
   4. Mailing 4 of 5 – twelve weeks after initial estimated peak VO_2 testing
      (a) AHA Pamphlet "Exercise Diary"
      (b) Postcard with reminder of next testing date/time and RHR reminder
      (c) Positive reinforcement note, handwritten.
   5. Mailing 5 of 5 - thirty weeks after initial estimated peak VO_2 testing
      (a) Reminder of next testing date/time and RHR reminder

C. Action/Maintenance
   1. Mailing 1 of 4 - six weeks after initial estimated peak VO_2 testing
      (a) AHA pamphlet "Exercise Diary"
      (b) Positive reinforcement note, handwritten.
   2. Mailing 2 of 4 - eight weeks after initial estimated peak VO_2 testing
      (a) Handwritten positive reinforcement message

3. Mailing 3 of 4 – fourteen weeks after initial estimated peak VO_2 testing
   (a) Postcard with reminder of next testing date/time and RHR reminder
   (b) Positive reinforcement note, handwritten.
4. Mailing 4 of 4 – thirty weeks after initial estimated peak VO_2 testing
   (a) Postcard with reminder of next testing date/time and RHR reminder

D. Control Group
   1. Mail postcard at week 6, 14 and 30 after initial estimated peak VO_2 testing with reminder of next testing date/time and need to measure resting heart rate and bring to next testing.

Appendix C

Physical Activity Self-Efficacy Questionnaire (McAuley & Courneya, 1994)

Name _____

The following items reflect situations that are listed as common reasons for preventing individuals from participating in physical activity sessions or, in some cases, dropping out. Using the scales below please indicate how confident you are that you could be physically active in the event that any of the following circumstances were to occur.

For example, if you have complete confidence that you could be physically active even if you were bored by the activity, you would circle 100%. However, if you had no confidence at all that you could be physically active, if you failed to make or continue making progress (that is, confident you could not be physically active), you would circle 0%.

Please answer honestly and accurately. There are no right or wrong answers.

I BELIEVE THAT I COULD CONTINUE TO BE PHYSICALLY ACTIVE 3 TIMES PER WEEK FOR THE NEXT 4 MONTHS IF:

1. The weather was very bad (hot, humid, rainy, cold)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT — MODERATELY CONFIDENT — HIGHLY CONFIDENT

2. I was bored by the program or activity

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT — MODERATELY CONFIDENT — HIGHLY CONFIDENT

3. I was on vacation

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT — MODERATELY CONFIDENT — HIGHLY CONFIDENT

4. I was not interested in the activity

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT — MODERATELY CONFIDENT — HIGHLY CONFIDENT

5. I felt pain or discomfort when engaged in the activity

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT MODERATELY CONFIDENT HIGHLY CONFIDENT

6. I had to be physically active alone

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT MODERATELY CONFIDENT HIGHLY CONFIDENT

7. It was not fun or enjoyable

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT MODERATELY CONFIDENT HIGHLY CONFIDENT

8. It became difficult to get to the location for the physical activity

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT MODERATELY CONFIDENT HIGHLY CONFIDENT

9. I didn't like the particular activity program I was involved in

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT MODERATELY CONFIDENT HIGHLY CONFIDENT

10. My work schedule conflicted with my activity session

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT MODERATELY CONFIDENT HIGHLY CONFIDENT

11. I felt self-conscious about my appearance when I was active

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT MODERATELY CONFIDENT HIGHLY CONFIDENT

12. There was no one to offer me encouragement

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
NOT AT ALL CONFIDENT MODERATELY CONFIDENT HIGHLY CONFIDENT

13. I was under personal stress of some kind

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
NOT AT ALL CONFIDENT			MODERATELY CONFIDENT					HIGHLY CONFIDENT		

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Appendix D

Exercise Motivation Inventory (Markland, 1997)

The Exercise Motivation Inventory - 2 (EMI-2)

On the following pages are a number of statements concerning the reasons people often give when asked why they exercise. *Whether you currently exercise regularly or not,* please read each statement carefully and indicate, by circling the appropriate number, whether or not each statement *is true* for you personally, *or would be true* for you personally if you did exercise. If you do not consider a statement to be true for you at all, circle the '0'. If you think that a statement is very true for you indeed, circle the '5'. If you think that a statement is partly true for you, then circle the '1', '2', '3' or '4', according to how strongly you feel that it reflects why you exercise or might exercise.

Remember, we want to know why *you personally* choose to exercise or might choose to exercise, not whether you think the statements are good reasons for *anybody* to exercise.

It helps us to have basic personal information about those who complete this questionnaire. We would be grateful for the following information:

Your age ..... years **Your gender ..... male/female**

		Not at all true for me					**Very true for me**
Personally, I exercise (or might exercise) ...							
1	To stay slim	0	1	2	3	4	5
2	To avoid ill-health	0	1	2	3	4	5
3	Because it makes me feel good	0	1	2	3	4	5
4	To help me look younger	0	1	2	3	4	5
5	To show my worth to others	0	1	2	3	4	5
6	To give me space to think	0	1	2	3	4	5

	Personally, I exercise (or might exercise) ...	Not at all true for me					Very true for me
7	To have a healthy body	0	1	2	3	4	5
8	To build up my strength	0	1	2	3	4	5
9	Because I enjoy the feeling of exerting myself	0	1	2	3	4	5
10	To spend time with friends	0	1	2	3	4	5
11	Because my doctor advised me to exercise	0	1	2	3	4	5
12	Because I like trying to win in physical activities	0	1	2	3	4	5
13	To stay/become more agile	0	1	2	3	4	5
14	To give me goals to work towards	0	1	2	3	4	5
15	To lose weight	0	1	2	3	4	5
16	To prevent health problems	0	1	2	3	4	5
17	Because I find exercise invigorating	0	1	2	3	4	5
18	To have a good body	0	1	2	3	4	5
19	To compare my abilities with other peoples'	0	1	2	3	4	5
20	Because it helps to reduce tension	0	1	2	3	4	5
21	Because I want to maintain good health	0	1	2	3	4	5
22	To increase my endurance	0	1	2	3	4	5
23	Because I find exercising satisfying in and of itself	0	1	2	3	4	5

	Not at all true for me					Very true for me
Personally, I exercise (or might exercise) ...						
24 To enjoy the social aspects of exercising	0	1	2	3	4	5
25 To help prevent an illness that runs in my family	0	1	2	3	4	5
26 Because I enjoy competing	0	1	2	3	4	5
27 To maintain flexibility	0	1	2	3	4	5
28 To give me personal challenges to face	0	1	2	3	4	5
29 To help control my weight	0	1	2	3	4	5
30 To avoid heart disease	0	1	2	3	4	5
31 To recharge my batteries	0	1	2	3	4	5
32 To improve my appearance	0	1	2	3	4	5
33 To gain recognition for my accomplishments	0	1	2	3	4	5
34 To help manage stress	0	1	2	3	4	5
35 To feel more healthy	0	1	2	3	4	5
36 To get stronger	0	1	2	3	4	5
37 For enjoyment of the experience of exercising	0	1	2	3	4	5
38 To have fun being active with other people	0	1	2	3	4	5

	Not at all true for me					Very true for me
Personally, I exercise (or might exercise) ...						
39 To help recover from an illness/injury	0	1	2	3	4	5
40 Because I enjoy physical competition	0	1	2	3	4	5
41 To stay/become flexible	0	1	2	3	4	5
42 To develop personal skills	0	1	2	3	4	5
43 Because exercise helps me to burn calories	0	1	2	3	4	5
44 To look more attractive	0	1	2	3	4	5
45 To accomplish things that others are incapable of	0	1	2	3	4	5
46 To release tension	0	1	2	3	4	5
47 To develop my muscles	0	1	2	3	4	5
48 Because I feel at my best when exercising	0	1	2	3	4	5
49 To make new friends	0	1	2	3	4	5
50 Because I find physical activities fun, especially when competition is involved	0	1	2	3	4	5
51 To measure myself against personal standards	0	1	2	3	4	5

Thank you for completing this questionnaire

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January 1997

Appendix E

Exercise Benefits/Barriers Scale (Sechrist, Walker, & Pender, 1987)

Strongly Disagree	Disagree	Agree	Strongly Agree	
○	○	○	○	1. I enjoy exercise.
○	○	○	○	2. Exercise decreases feelings of stress and tension for me.
○	○	○	○	3. Exercise improves my mental health.
○	○	○	○	4. Exercising takes too much of my time.
○	○	○	○	5. I will prevent heart attacks by exercising.
○	○	○	○	6. Exercise tires me.
○	○	○	○	7. Exercise increases my muscle strength.
○	○	○	○	8. Exercise gives me a sense of personal accomplishment.
○	○	○	○	9. Places for me to exercise are too far away.
○	○	○	○	10. Exercising makes me feel relaxed.
○	○	○	○	11. Exercising lets me have contact with friends and persons I enjoy.
				12. I am too embarrassed to exercise.
○	○	○	○	13. Exercising will keep me from having high blood pressure.
○	○	○	○	14. It costs too much money to exercise.
○	○	○	○	15. Exercising increases my level of physical fitness.
○	○	○	○	16. Exercise facilities do not have convenient schedules for me.
○	○	○	○	17. My muscle tone is improved with exercise.
○	○	○	○	18. Exercising improves functioning of my cardiovascular system.
○	○	○	○	19. I am fatigued by exercise.
○	○	○	○	20. I have improved feelings of well-being from exercise.
○	○	○	○	21. My spouse (or significant other) does not encourage exercising.

Strongly Disagree	Disagree	Agree	Strongly Agree	
○	○	○	○	22. Exercise increases my stamina.
○	○	○	○	23. Exercise improves my flexibility.
○	○	○	○	24. Exercise takes too much time from family relationships.
○	○	○	○	25. My disposition is improved by exercise.
○	○	○	○	26. Exercising helps me sleep better at night.
○	○	○	○	27. I will live longer if I exercise.
○	○	○	○	28. I think people in exercise clothes look funny.
○	○	○	○	29. Exercise helps me decrease fatigue.
○	○	○	○	30. Exercising is a good way for me to meet new people.
○	○	○	○	31. My physical endurance is improved by exercising.
○	○	○	○	32. Exercising improves my self-concept.
○	○	○	○	33. My family members do not encourage me to exercise.
○	○	○	○	34. Exercising increase my mental alertness.
○	○	○	○	35. Exercise allows me to carry out normal activities without becoming tired.
○	○	○	○	36. Exercise improves the quality of my work.
○	○	○	○	37. Exercise takes too much time from my family responsibilities.
○	○	○	○	38. Exercise is good entertainment for me.
○	○	○	○	39. Exercising increases my acceptance
○	○	○	○	40. Exercise is hard work for me.
○	○	○	○	41. Exercise improves overall body functioning for me.
○	○	○	○	42. There are too few places for me to exercise.
○	○	○	○	43. Exercise improves the way my body looks.

Appendix F

Stages of Change Questionnaire(Marcus, 1992b)

Name _____ Date _____

Physical activity or exercise includes activities such as brisk walking, jogging, swimming, aerobic dancing, biking, rowing etc. Activities that are primarily sedentary, such as bowling or playing golf with a golf cart, would not be considered exercise.

REGULAR EXERCISE = 3 TIMES OR MORE PER WEEK FOR 20 MINUTES OR LONGER EACH TIME

Part A

Please read the following statements and circle either Yes or No to all items.

1. I currently exercise. 0. No 1. Yes

2. I intend to exercise in the next 6 months. 0. No 1. Yes

3. I currently exercise regularly. 0. No 1. Yes

4. I have exercised regularly for the past 6 months. 0. No 1. Yes

5. I have exercised regularly in the past for a period of at least 3 months. 0. No 1. Yes

(If you do not currently exercise at all: Please skip to question #7)

6. If you CURRENTLY exercise at any level: Please answer a–d

   a. How many days per week do you exercise? _____ days

   b. Approximately how many minutes do you exercise each time? _____mins.

   c. How long have you been exercising at this level? _____months _____years

d. What activities do you do?

1. Walk
2. Run
3. Swim
4. Bike
5. Racquet
6. Child Care
7. Housework
8. Weight Lifting
9. Gardening
10. Dance
11. Misc.

(If you currently exercise at any level, skip to part B)

7. If you do NOT currently exercise at all:
   a. How long has it been since you have done regular physical activity or exercise (Please Circle One)
      1) Less than 1 month
      2) 1 – 3 months
      3) 4 – 6 months
      4) 7 – 11 months
      5) 1 –2 years
      6) 3 – 5 years
      7) More than 5 years
      8) I have never exercised regularly

Part B

1. How many flights of stairs do you climb up each day?
   (1 flight = 10 steps)
   _____ Flights per day.
2. How many city blocks or their equivalent do you walk each day? (12 blocks = 1 mile)
   _____ Blocks per day.

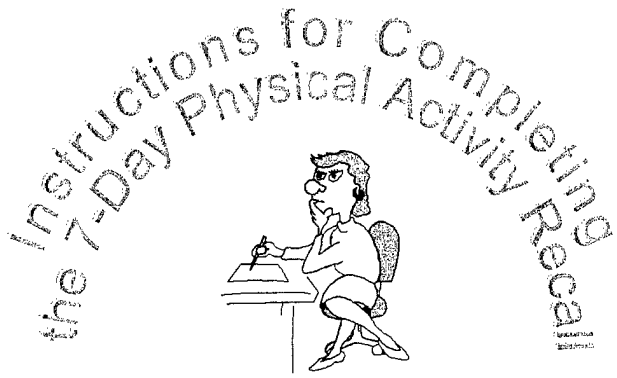
3. What is your usual pace of walking? (Please circle one)
   a. Casual or strolling (less than 2 mph)
   b. Average or normal (2 to 3 mph)
   c. Fairly brisk (3 to 4 mph)
   d. Brisk or striding (4 mph or faster)

4. At least once a week do you engage in any regular activity, like brisk walking, jogging, bicycling, or swimming, etc. long enough to work up a sweat, get your heart thumping, or get out of breath?

   0. No 1. Yes

   If yes: how many times per week? _____

Appendix G
Instructions for Completing the 7-Day Recall Booklet



DIRECTIONS FOR COMPLETING THE ENERGY EXPENDITURE CHART

⇒ Keep a record of your daily activities and your resting heart rate (see separate instructions) for seven consecutive days in the recording booklet "7-Day Physical Activity Recall & Resting Heart Rate".

⇒ At the end of each day, calculate how many hours you spent in each level of activity.

⇒ Put your total in the appropriate blanks on the chart for each day.

⇒ If you multiply your total in line 7 with your body weight (in kg), you will have your total caloric expenditure for the day.

⇒ We do not specifically look at **light activities** such as: slow walking, light housework, or unstrenuous sports such as bowling, archery or softball. These make up that part of the day you are not sleeping or involved in other activities.

⇒ **Moderate activities** include:

Occupational tasks: delivering mail or patrolling on foot; house painting; truck driving (making deliveries, lifting and carrying light objects).

Household tasks: raking the lawn; sweeping and mopping; mowing the lawn with a power mower; cleaning windows.

Sports activities (actual playing time): volleyball; Ping-Pong; brisk walking for pleasure or to work (3 miles/hr or 20 min/mile); golf, walking, and pulling or carrying clubs; calisthenic exercises.

⇒ **Hard activities** include:

Occupational tasks: heavy carpentry; construction work; doing physical labor.

Household tasks: scrubbing floors.

Sports activities (actual playing time): tennis doubles; disco, square or folk dancing.

⇒ **Very hard activities** include:

Occupational tasks: very hard physical labor, digging or chopping with heavy tools; carrying heavy loads such as bricks or lumber.

Sports activities (actual playing time): jogging or swimming; singles tennis; racquetball; soccer.

⇒ The above are examples. You will also be provided with the "Classification by Energy Cost of Human Activities" which is a much more comprehensive list. If using this list round up or down to the nearest MET value for the chart.

⇒ After completing the 7-Day Physical Activity & Resting Heart Rate Booklet please return it to Maj Nelson as soon as you can.

Appendix H

7-Day Physical Activity Recall (Blair, 1991)

Name _____ **Today's Date** _____

Energy Expenditure Chart

(1) Activity Type	(2) METs	X	(3) Hours of Activity	=	(4) Calorie Expenditure per kg of Weight
1. Sleep	1		_____		_____
2. Moderate	4		_____		_____
3. Hard	6		_____		_____
4. Very Hard	10		_____		_____
5. Total hours from 1-4			_____		
6. Light*	1.5		_____		_____
7. Total calories expended per kg today					_____
8. Weight (in kg)					_____
9. Total calories expended					_____

*This number is derived by subtracting the total on line 5 from 24.

Directions for completing The Energy Expenditure Chart

- **Keep a record of your daily activities.**
- **At the end of the day, calculate how many hours you spent in each level of activity.**
- **Put your totals in the appropriate blanks on the chart above.**
- **The total in line number 7 is the number you will place on the your Calorie Expenditure Graph on page 38.**
- **If you multiply your total in line 7 with your body weight (in kg), you will have your total caloric expenditure for the day.**

Please refer back to Pam's example calculations if you need help with The Energy Expenditure Chart.

Physical Activity Recall Items

Now we would like to know about your physical activity during the past 7 days. But first, let me ask you about your sleep habits.

1. On the average, how many hours did you sleep each night during the last 5 weekday nights (Sunday-Thursday)? ___ hours

2. On the average, how many hours did you sleep each night last Friday and Saturday nights? ___ hours

Now I am going to ask you about your physical activity during the past 7 days, that is, the last 5 weekdays and last weekend, Saturday and Sunday. We are not going to talk about light activities, such as slow walking or light housework, or unstrenuous sports such as bowling, archery, or softball. Please look at this list, which shows some examples of what we consider moderate, hard, and very hard activities. [Interviewer: hand subject card No. 9 and allow time for the subject to read it over.] People engage in many other types of activities, and if you are not sure where one of your activities fits, please ask me about it.

3. First, let's consider moderate activities. What activities did you do and how many total hours did you spend during the last 5 weekdays doing these moderate activities or others like them? Please tell me to the nearest half hour. ___ hours

4. Last Saturday and Sunday, how many hours did you spend on moderate activities and what did you do? (Probe: Can you think of any other sports, job, or household activities that would fit into this category?) ___ hours

5. Now, let's look at hard activities. What activities did you do and how many total hours did you spend during the last 5 weekdays doing these hard activities or others like them? Please tell me to the nearest half hour. ___ hours

6. Last Saturday and Sunday, how many hours did you spend on hard activities and what did you do? (Probe: Can you think of any other sports, job, or household activities that would fit into this category?) ___ hours

7. Now, let's look at very hard activities. What activities did you do and how many total hours did you spend during the last 5 weekdays doing these very hard activities or others like them? Please tell me to the nearest half hour. ___ hours

8. Last Saturday and Sunday, how many hours did you spend on very hard activities and what did you do? (Probe: Can you think of any other sports, job, or household activities that would fit into this category?) ___ hours

9. Compared with your physical activity over the past 3 months, was last week's physical activity more, less, or about the same?

___ 1. More
___ 2. Less
___ 3. About the same

Interviewer: Please list below any activities reported by the subject which you don't know how to classify. Flag this record for review and completion.

Activity (brief description)	Hr: workday	Hr: weekend day

Card No. 9
Examples of Activities in Each Category

Moderate Activity

Occupational tasks: delivering mail or patrolling on foot; house painting; truck driving (making deliveries, lifting and carrying light objects)

From Sallis, J.F., Haskell, W.L., Wood, P.D., Fortmann, S.P., Rogers, T., Blair, S.N., and Paffenbarger, R.S., Jr. (1985). Physical activity assessment methodology in the five-city project. *American Journal of Epidemiology*, 121, pp. 91-106. Copyright 1985 by The American Journal of Epidemiology. Adapted with permission.

Household tasks: raking the lawn; sweeping and mopping; mowing the lawn with a power mower; cleaning windows

Sports activities (actual playing time): volleyball; Ping-Pong; brisk walking for pleasure or to work (4.83 km/hr [3 miles/hr] or 20 min/km [mile]); golf, walking, and pulling or carrying clubs; calisthenic exercises

Hard Activity

Occupational tasks: heavy carpentry; construction work, doing physical labor

Household tasks: scrubbing floors

Sports activities (actual playing time): tennis doubles; disco, square, or folk dancing

Very Hard Activity

Occupational tasks: very hard physical labor, digging or chopping with heavy tools; carrying heavy loads such as bricks or lumber

Sports activities (actual playing time): jogging or swimming; singles tennis; racquetball; soccer

Note. Some examples of various levels of activity are given. However, the list in Appendix C is more comprehensive and can be used with moderate activities rated 3 to 5 METs; hard activities, 5.1 to 6.9 METs; and very hard activities, 7 METs and more.

Appendix I

Instructions for Obtaining a Resting Heart Rate

One way to see the benefits of increased physical activity on the heart is by knowing your resting heart rate (RHR). As part of this study I would like you to find out what your RHR is 7-14 days before each of your scheduled measurement sessions. This value will be an indirect indicator of your physical fitness. The best time to find your resting heart rate is prior to getting up in the morning. This is tricky though because your heart rate increases by about 10 beats per minute (BPM) as soon as you get out of bed, and it can also increase in response to an alarm clock and any anxiety, such as thoughts about the day ahead. To find your RHR, take your pulse immediately upon waking for seven days. The resting heart rate is best found by averaging the RHR on these occasions. (Bishop & Aldana, 1999 & Pfitzinger, 1998).

In most people, the pulse can be felt wherever a large artery lies near the surface of the skin – at the neck or wrist. The pulse can also be felt on the chest near the heart by lying your palm on your chest over your heart. To take your pulse at the neck or wrist, place your first two fingers gently over the artery. In the neck the artery is just to the side of your voice box, in the wrist the artery is on the inside of your wrist near the base of the thumb. To feel the pulse press gently but firmly on the artery where you can feel the pulsing of blood as it is pushed through the artery by the heart. Do not use the thumb; it also has a pulse and will cause you to miscount. If you can't feel your pulse you may be pressing too hard or too lightly. Try feeling your pulse until you can count it easily. Count the number of times you feel your heart beat in 15 seconds and multiply by 4. This gives you the number of beats per minute.

After completing the 7-Day Physical Activity & Resting Heart Rate Booklet bring it with you to your scheduled measurement session.

Appendix J

Administering the Submaximal Ergometry Test

Fitness Assessment

Administering the fitness assessment involves four basic steps, and each step uses a different screen. These screens are as follows:

- The Individual and Assessment Information screen
- The Questionnaire screen
- The Starting Heart Rate screen
- The Fitness Assessment screen

To begin an assessment, click the **Fitness Assessment** button on the **Main Menu** screen.

Individual and Assessment Information Screen

The **Individual and Assessment Information** screen provides a place for you to enter the individual's information. You can change the data in any field except the SSN (Social Security Number) . If you enter an incorrect SSN, press the **ESC** key twice to clear the record. Select **Terminate Assessment** and start over. To move from one field to another, use the **TAB** key or mouse. To erase an entry, highlight the field and press the **Delete** key.

To enter personal information

Fill in each field as required, using either the type ahead capability or drop down menus where possible.

1. After all data fields are filled, click on the **Arrow** button for **Continue Assessment**.
2. Enter the individual's weight in the **Weight** field. The individual's weight must be between 60.00 and 400.00 lb.
3. Enter the individual's height in the **Height** field - to the hundredths (e.g., 72.50; 72.25). The individual's height must be between 36.00 and 90.00 inches.

NOTE: Precise weight and height measurements are essential for a valid outcome.

4. Verify the individual's age. If it is not correct, inform the IFPM as soon as possible. Select the test reason (either annual or retest).
5. Click on the **Arrow** button for **Continue Assessment.**
6. The **Questionnaire Screen** appears.

NOTE: If all data fields are not filled. a pop-up error message appears, prompting to enter information.

Questionnaire Screen

Use the **Questionnaire** screen to gather information about exercise, smoking habits, and use of beta blockers (or other medication which could invalidate the assessment).

Answering the Questions

When the **Questionnaire** screen first comes up, **YES** is the default answer for physical activity and **NO** is the default for the smoking and medication questions. If the default answers are correct, just click the continue assessment button at the bottom of the screen. Otherwise, follow the directions below to answer the three questions on the screen:

1. **Physical Activity**: Click the check box under **YES** or **NO**. Press **TAB**.
2. **Smoking Habits**: If the answer to question two (tobacco use) is **YES**, then a pop-up screen appears. When the pop-up screen appears, click on each type of tobacco product(s) that the individual uses:
   - If cigarettes are used, click the **CIGARETTES** check box .
   - If pipe/cigars are used, click the **PIPE/CIGAR** check box .
   - If smokeless tobacco is used, click the **SMOKELESS** check box .
3. **Heart Medication**: If the default is changed on the last question to signify the use of a medication which alters heart rate, a pop-up message states that testing is not valid and can be unsafe for persons on Beta Blockers. **Persons on Beta Blockers will not be tested.** Click on **OK**. The screen returns to the **Main Menu**. No data is recorded or saved. The fitness assessment is halted until further medical advice is given. Refer the individual to the IFPM for further evaluation/ information. Pressing **CANCEL** will return back to the **Questionnaire** screen.
4. If the answer on the last question is the default answer, click the **Continue Assessment** button.
5. The **Starting Heart Rate** screen appears.

Starting Heart Rate Screen

The purpose of the **Starting Heart Rate** screen is to record the individual's starting heart rate and allow the computer to compute the appropriate workload – taking into account the individual's age, gender, and other personal information.

To enter the individual's starting heart rate

1. Enter the individual's heart rate as shown on the heart rate monitor.
2. The range of acceptable starting heart rates is 20 to 110. Any number outside this range will cause a pop-up message to appear stating that the heart rate must be within range to start the assessment.
3. A starting heart rate over 100 generally indicates anxiety. When the individual's starting rate is over 100, allow the individual two minutes to

relax before continuing. Encourage him/her to relax during the two minute break.

4. A persistent starting heart rate above 100 bpm may suggest the need for a medical checkup before or after testing. This checkup should confirm the test observation of *tachycardia* and determine if an underlying cause should be evaluated prior to beginning an exercise program.
5. Once the starting heart rate is entered, the message *"Set the warm-up workload to ....."* appears on the screen.
6. Set the workload gauge on the cycle according to the directions on the screen.
7. Click the **Continue Assessment** button.
8. The **Fitness Assessment** screen appears.

Fitness Assessment Screen

The **Fitness Assessment** screen is the heart of the fitness assessment. It is the screen on which you will enter the individual's active heart rate at the fifty-fifth second of each minute during the entire assessment.

Once you begin the assessment, the steps happen quickly and there is very little time to read or think about what to do next. The only way to stop is to invalidate the entire assessment. There is no way to pause or call for a time out, so it is important to have a good understanding of the assessment process and the role of the test administrator.

To brief the individual

Be sure that the:

1. Individual is comfortable and ready to begin.
2. Heart rate monitor is still attached to the individual.
3. Heart rate monitor is positioned so that you can easily read the heart rate yet still receive a good signal from the transmitter.
4. The metronome is turned on.
5. The individual understands the fitness assessment process.

To administer the fitness assessment

1. Instruct the individual to begin pedaling.
2. Click the **START ASSESSMENT** button.
3. The timer on the screen begins.
4. Do the following three things throughout the assessment:
   - Monitor both the screen and the heart monitor.
   - Be prepared to react when the timer reaches the 55-second mark.
   - Be sure the individual is keeping up a steady rhythm (50 rpm rhythm set by the metronome).

NOTE: At 55 seconds, a pop-up message asks you to enter the individual's heart rate within 15 seconds or the test will be invalidated.

5. Type the individual's current heart rate.
6. Immediately press **ENTER**.
7. Adjust the workload, according to directions in the pop-up message. Make the adjustment as soon as possible so the next heart rate reading will be accurate. Click **OK**.
8. Every 55 seconds, a pop-up message tells you to enter the individual's heart rate. Wait and watch for the next pop-up message.
9. At the appearance of each pop-up message, type the individual's heart rate. Press **ENTER**.
10. Read directions for adjusting the workload, adjust workload as indicated. Click **OK**.
11. When the assessment is complete, a pop-up message appears and tells the test administrator to perform a cool-down period. Click **OK.** The results of the assessment appear on the screen in the form of a report.
12. Tell the individual the results – both the numerical score and the minimum fitness standard.
13. Click on the **Print** icon in the Tool Bar or select the **Print** option from the pull down **File** menu. A copy of the individual's test results will be printed out.
14. Give the individual the print-out of his/her test results. This concludes the assessment.
15. The FAM can also print a report from the **Main Menu** for the individual that provides all the information stored for the assessment just taken (**Individual Last Assessment**). Refer to the Preparing Reports section on page 35 to describe this operation.

To handle an assessment when the individual's heart rate exceeds limit

NOTE: If, at any time during the assessment, the individual's heart rate exceeds a pre-determined value, a pop-up message warns that the test is being stopped. The maximum allowable heart rate is displayed at the top right portion of the screen.

1. Inform the individual of the action.
2. Instruct him/her to reschedule at a later date.

Terminating an assessment

If, at any time during the assessment, the test needs to be manually terminated, the person giving the test must double-click the **Terminate Assessment/STOP** button. A pop-up message box asks for the reason the test was terminated.

Possible Reasons:

- Heart Rate Exceeded 85% Of Maximum
- Ending Heart Rate Varied Over 5bpm
- Subject Unable To Pedal At 50 rpm
- Variable Increasing Heart Rate
- Subject Requested Termination
- Other (Operator error)

Select the reason and click **OK**. Clicking **Cancel** returns back to the **Fitness Assessment** screen.

Practice Fitness Assessment

The Practice Fitness Assessment is exactly the same as an actually Fitness Assessment except that the information entered is for the **practice assessment only**. The information is not saved to the data file for future use (i.e. conducting an actual assessment or producing reports). Refer to the Fitness Assessment section on page 30 on how to perform an assessment.

Manual Assessment (IFPM Only)

The Manual Fitness Assessment is an actual Fitness Assessment that gives the IFPM the ability to set the workload themselves or use the suggested workloads provided by the program. The test administrator will have the option of whether or not to save all information to the data file for future use (i.e. producing reports). The procedures will be the same except that you will be able to change the workload manually when conducting a Manual Fitness Assessment. Refer to the Fitness Assessment section on page 30 on how to perform an assessment.

Attachment 1

Recruitment Information Booklet

Slow the beat and save your heart with regular physical activity

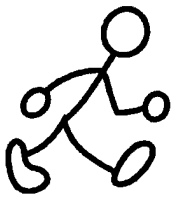
We're with you

100% of the way

Want to feel better and maybe add life to your years?

Then join our physical activity study

Physical activity on your time at your convenience



MARRAN

Maj Nelson
Phone: 301-434-5514
Fax: 301-434-1131
E-mail:
msnelson@erols.com

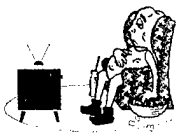
This invitation is being offered to you because you're healthy and we want you to stay that way

The point of this study is to help us gain a better understanding of what motivates people to be physically active in their daily lives and to remain active over time. We are interested in all kinds of physical activity not just the traditional running, biking, etc.

This is not your typical exercise program because there are no organized "exercise" classes to attend. You move at your own pace at your own convenience with help when you need it.

There really is nothing to lose by joining the study and you may actually improve your heart function and increase your energy levels.

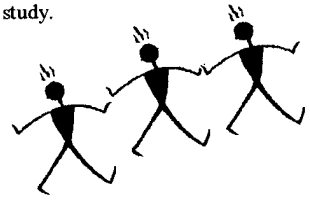
We are interested in everybody; you don't need to be an exerciser to join us and if you're already physically active we want you too.



The study is divided into two groups. Each group will get a different method of help to be more active. The assistance you receive from us will last about 4 months. In order to tell which method of help is best we will have you fill out some questionnaires and we will test your fitness level.

What we would ask from you today is to answer a few questions about your health and physical activity level now. If there is no medical reason you cannot be included in the study and if you are going to be in the area over the next four months we would be thrilled to have you in our study.

After looking at this brief introduction I am sure you may have questions. Please ask us. If you want to be included in this important work please let the technician taking your pulse and blood pressure know you're interested in the study.



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Attachment 2

Bicycle Ergometry Instructions

The Next Step

Measuring Your Oxygen Level During Exercise on a Stationary Bicycle & Questionnaire Completion

Welcome Aboard! We are so pleased that you are joining us in our study of physical activity. The next part of the study is for information gathering. We will calculate your oxygen use during exercise and have you fill out some questionnaires. Once this is completed we will discuss a personalized physical activity plan with you. You are scheduled for these activities on:

_____at _____In_____

(date) (time) (location)

Your oxygen level during exercise will be tested by a submaximal ergometry "bike test". In this test your heart rate change during the bike test is measured; this gives us an estimate of your oxygen use during the exercise. Oxygen use during exercise is one way to look at your fitness level. You will ride the bike between 8-14 minutes; the difficulty of pedaling will be adjusted based on your heart rate. Throughout the test your heart rate is carefully recorded. Your oxygen use during the bike test is calculated from your heart rate response while you pedal.

<u>To get ready for the bike test we suggest that you:</u>

1. Stay calm. Do not "pump yourself up" like you would for a running race. Try not to make your heart beat faster. Pedal with as little effort as possible. Try not to be anxious or to worry. There is no passing or failing this test.
2. Get a good night's sleep before the test.
3. Do not drink alcohol or do heavy physical activity the night before or the day of your bike test. Do not have a lot of caffeine, tobacco, or alcohol, or eat heavy spicy meals. Two hours before the test stop drinking beverages with caffeine (coffee, tea, soda, etc.). One hour before the test do not use tobacco and limit eating. Drink water and juices. Do not change your normal habits if it makes you too anxious or nervous.
4. Wear comfortable clothing and shoes, athletic clothing is best. For women please do not wear underwire bras, these interfere with the heart rate monitor which is placed around your lower chest. All testing will be as private as possible.

Attachment 3

Informed Consent

SCHOOL OF MEDICINE

DEPARTMENT OF MEDICINE
DIVISION OF GERONTOLOGY

UNIVERSITY OF MARYLAND

INFORMED CONSENT DOCUMENT

_____
_____
_____
_____

Privacy Act of 1974 applies. DD Form 2005 filed in Clinical/ Medical Records.

PRIVACY ISSUES: *Records of my participation in this study may only be disclosed in accordance with federal law, including the Federal Privacy Act, 5 USC 552a, and its implementing regulations. DD Form 2005 contains the Privacy Act Statement for the records. I understand that records of this study may be inspected by the U.S. Food and Drug Administration (FDA), the sponsoring agency and/or their designee, if applicable.*

TITLE OF STUDY

A Physical Activity Intervention to Improve Cardiovascular Fitness in a Military Primary Care Population

INVESTIGATORS' NAMES, DEPARTMENTS, PHONE NUMBERS

Principal Investigator: Karen E. Dennis, Ph.D., R.N., FAAN UMB, 410-605-7000 ext 5424
Additional Investigator: Mary S. Nelson, Maj USAF, NC (Ph.D. Candidate University of Maryland) 301-434-5514
Christopher S. Robinson Capt USAF, BSC (Ph.D.)USUHS 301-295-9466

PURPOSE OF STUDY

(This section will explain the nature, purpose(s), approximate number of subjects, and the duration of participants' involvement.)

I, _____ (SSN: ___ - ___ - ____), understand that I am being asked to participate in a research study that is being monitored by the School of Nursing at the University of Maryland. The purpose of this study is to help me to be more physically active in my daily life without making me come to an exercise class. This will keep my heart and blood vessels healthier and cut down on my risk of having a heart attack. There are two different physical activity programs in this study. Fifty people will be in one group and fifty people will be in the other. The group I am in is decided by the flip of a coin. My participation is voluntary. I do have to be eligible for military health care if I am in the study though. The study lasts for 8 months. During the 8 months there will be 4 times when I will be asked to come to the Health and Wellness Center to fill out some questionnaires and to have my fitness measured on a stationary bicycle. These meetings should last no longer then an hour and will probably be shorter. All meetings will be scheduled at a time convenient for me. Testing is done when I begin the study, at 2 months, 4 months and 8 months. Some people may also get two or three short phone calls (2-3 minutes) or we may get postcards and other material in the mail. Other group members might get a self-instruction book to help them be more active.

PROCEDURES

(This section will explain all procedures and the purpose of the procedures to be undergone as part of this study. Any experimental procedures will be explained as such.)

I was identified as a possible volunteer for this study based on my connection with the Andrews AFB, outpatient clinics, and my present health status. During this study there will be three times when a fitness assessment is done. This is done on a stationary bike. This gives the researcher an idea of my fitness level by looking at the change in my heart rate while I pedal on the bike. This test has been used since the late 1950s and is a safe test. Before I am tested though I will fill out a health-screening questionnaire and be medically cleared to be in the study.

Reply to: Baltimore VA Medical Center • Geriatrics Service/GRECC BT (18) GR
10 North Greene Street • Baltimore, Maryland 21201-1524 • 410 605 7185 • 410 605 7913 fax

UMAB IRB APPROVED 4-29-99

BENEFITS

I understand that no benefit can be guaranteed. However, it is intended that this treatment will provide a response as good as or better than conventional therapy. The good part of being in this study is that I may have less risk of having a heart attack in the future and you will be making my heart and blood vessels healthier and stronger. The purpose of this study is to benefit me. At this time, the investigator(s) does not know if the most commonly accepted treatments achieve the best possible results. This study has been designed to learn if the new treatment is as good as or better than the most commonly accepted treatments. I understand though that participating in this study does not guarantee benefit better than standard treatment; I may become more fit but there is a possibility I may not become more fit too.

ALTERNATIVES

(This section will explain your alternative treatment possibilities)

You could increase your physical activity without the help of this program or you could sign up for a commercial program.

RISKS/INCONVENIENCES

(Any discomfort , risks, inconveniences caused from procedures or drugs used that may be expected from participation in this study.)

The physical activity involved in this research study **DOES NOT** present a risk to unborn children, however I understand that if I am pregnant I cannot participate in the study. Since this possibility exists, AS A FEMALE of childbearing potential, my health care provider will do a serum (blood) or urine pregnancy test before I participate in the study. I will be expected to use adequate birth control measures for the duration of the study. If I should become pregnant during the study, I will immediately inform the investigator. The bike test lasts from 8 – 14 minutes and might make me feel sweaty, feel a faster heart rate and have faster breathing. Other things, which probably won't happen, but that could happen are an abnormal blood pressure, passing out, an irregular heart rhythm, and in rare instances, heart attack, stroke, or death. The test will be stopped if the person doing the testing does not feel I can keep going or if I want to stop the test. The test administrator will also look at my blood pressure and heart rate. A trained tester will run all of these tests.

EVENT OF INJURY

I understand that my entitlement to medical and dental care and/or compensation in the event of injury is governed by federal laws and regulations, and if I have questions about my rights or if I believe I have received a research-related injury, I may contact the Medical Center Patient Representative, at _____ or the Director of the Clinical Investigation Facility at and/or the investigator _____ at _____.

The University of Maryland is committed to providing subjects of its research all rights due to them under state and federal law. You give up none of your legal rights by signing this consent form or by participating in the research project. Please call the Institutional Review Board (IRB) if you have any questions about your rights as a research subject.

The research described in this consent form has been classified as minimal risk by the University of Maryland Institutional Review Board (IRB), a group of scientists, physicians, and other experts. The Board's membership includes persons who are not affiliated with the University and persons who do not conduct research projects. The Board's decision that the research is minimal risk does not mean that the research is risk-free, however, generally speaking, you are assuming the risks of research participation, as discussed in the consent form. But, if you are harmed as a result of the negligence of a researcher, you can make a claim for compensation. If you believe you have been harmed through participation in this research study as a result of researcher negligence, you can contact the IRB for more information about claims procedures.

Institutional Review Board
University of Maryland
655 West Lombard Streeet, #BRB-14-016
Baltimore, Maryland 21201
(410)-706-5037

OCCURRENCE OF UNANTICIPATED EVENT

If an unanticipated event (clinical or medical misadventure) occurs during my participation in this study, I will be informed. If I am not competent at the time to understand the nature of the event, such information will be brought to the attention of my guardian or next of kin.

AUTHORIZATION FOR RELEASE

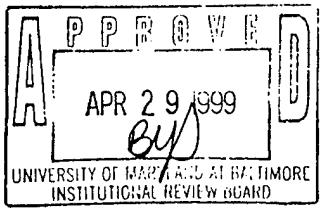
(The following statement is to be included and applies **ONLY** if it is known that commercial or outside use of donated samples is anticipated.)

Not Applicable

DECISION TO PARTICIPATE

The decision to participate in this study is completely voluntary on my part. No one has coerced or intimidated me into participating in this program. I am participating because I want to. My investigator(s) has adequately answered any and all questions I have about this study, my participation, and the procedures involved. I understand that the investigator will be available to answer any questions concerning procedures throughout this study. I understand that if significant new findings develop during the course of this study that may relate to my decision to continue participation, I will be informed. I further understand that I may withdraw this consent at any time and discontinue further participation in this study without prejudice to my entitlement to care. I also understand that the investigator of this study may terminate my participation in this study at any time if he/she feels this to be in my best interest. I have been provided a copy of this consent form.

NOT VALID WITHOUT THE
IRB STAMP OF
CERTIFICATION



VALID FROM 4-29-99 TO 4-28-00

RPN NO. 0399202

My signature below indicates my willingness to participate in this research study.

(Subject's Printed Name)	(Subject's SSN)	
(Subject's Signature)	(FMP & Sponsor's SSN)	(Date)

If subject is a minor and in the opinion of the investigator(s) the minor can understand the nature and consequences of his/her participation in the study, the minor should be fully informed and indicate his or her assent by signing above. If such minor subject is physically unable to sign, the parent or guardian may sign for him or her as evidence of the minor's assent.

(Parent/Guardian's Signature)	(FMP & Sponsor's SSN)	(Date)
(Advising Investigator's Signature)	(Investigator's SSN)	(Date)
(Witness's Signature)	(Witness's SSN)	(Date)

Distribution:
(1) Clincal Investigation Facility (CIF);
(2) Subject's Medical Record, (to be maintained permanently);
(3) Principal Investigator;
(4) Subject.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 89TH AIRLIFT WING (AMC)

19 March 1999

MEMORANDUM FOR AFMOA/SGOT
110 Luke Avenue, Room 405
Bolling AFB, D.C. 20332-7050
Attention: Ms. D. Casto

FROM: 89 MDG/SGAT

SUBJECT: Approval of protocol, "FMG1999006H - A Physical Activity Intervention to Improve Cardiovascular Fitness in a Military Primary Care Population", Maj M. Nelson

Request concurrence of the above-mentioned protocol. It has been determined that it is a minimal risk study. It was approved by the IRB, 10 Mar 99, pending approved changes. Changes were received and approved 18 Mar 99. If you have any questions, please contact TSgt Huff at DSN 857-6062. Thank you.

FELIPE E. VIZCARRONDO, COL, USAF, MC
Chief of Medical Staff

Attachment 4

Exercise Prescription

EXERCISE PRESCRIPTION

Based on your health status, it is recommended that you do the following to improve and/or maintain your heart health

SUGGESTED PROGRAM (FITTE)

Frequency F _____ times per week
Intensity I _____ HR range
Time T _____ minutes per session
Type T _____ type of physical activity
Enjoyment E _____

Current threats to your heart health are
___ Smoking
___ Hypertension
___ Elevated Lipids
___ Physical Inactivity
___ Body Weight

I agree to try this exercise plan from _____ (date) to _____ (date)

_____ (patients signature)

_____ (investigators signature)

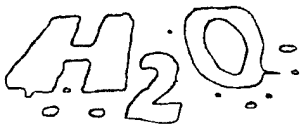
EXAMPLES OF MODERATE ACTIVITY
Walking (at home, to work, on lunch break
Gardening regularly, Hiking, Slow cycling,
Folk, Square or Popular Dancing, Ice or Roller Skating,
Doubles Tennis, Taking Stairs

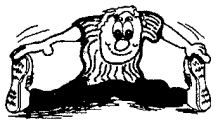
EXAMPLES OF VIGOROUS ACTIVITY
Jogging, Aerobic Dance, Basketball, Fast Cycling,
Cross-country Skiing, Swimming Laps, Singles Tennis
Racket Sports, Soccer

Attachment 5

Safety Guidelines

Safety Guidelines for Physical Activity



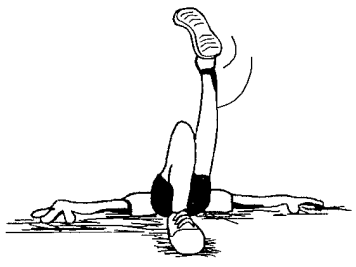


Certain lifestyle habits, such as increased physical activity, can reduce your risk of early death and disease. These habits can also improve your sense of total well being and give you more energy.

For most people physical activity does not pose any major health risks. However, increasing your physical activity level might pose some kind of dangers for some people. Based on your health history and your primary care providers advice you appear to be free of disease and therefore can participate in this study. If your health changes since your last visit to your primary care provider, please let us know before you increase your current level of activity.

BE SMART
STRETCH

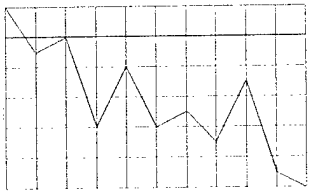
As you become more physically activity, some guidelines are important to keep in mind. First, if you ever feel chest pains, stop what you are doing and tell your doctor. Second, don't exercise when you are ill. Third, if you feel dizzy or sick to your stomach during exercise, stop and lie down on your back with your legs raised. Fourth, avoid "all out" efforts that leave you feeling sore and tired for many days. Fifth, never wear plastic or rubber suits to make yourself sweat. Injuries can and do occur at times when people are increasing their level of physical activity. If you do get injured the best thing to do is to seek prompt, proper first aid. Remember to drink plenty of fluid everyday and stretch slowly, especially after activity.



For Questions Contact:
Maj Mary Nelson
Phone: 301-434-5514
Fax: 301-434-1131
E-mail: msnelson@erols.com

Attachment 6

Progress Flowsheet



Tracking Your Progress

This is a worksheet you can use to track your heart health. At the end of each testing session we will provide you with values that you can enter on the chart.

Your health is influenced by many factors. These include your inherited traits, your work and living environment, and your lifestyle habits. Of these factors you have the most control over your lifestyle habits.

Aerobic fitness is the most important part of physical fitness. It is the fitness of your heart and lungs. Your "heart and lung" fitness can be talked about in terms of something called VO_2 max. VO_2 max is a measure of your body's ability to supply oxygen to the working muscles of your body. The higher your VO_2 max, the higher your aerobic fitness level. On the other hand, the lower your VO_2 max, the lower your aerobic fitness level.

Many things influence VO_2 max. These include: age, body fat percent, disease status, genetics, smoking status, and a sedentary lifestyle. Of these factors, you have the most control over the type of lifestyle you live. TO IMPROVE YOUR AEROBIC FITNESS LEVEL YOU SHOULD AVOID A SEDENTARY LIFESTYLE (i.e., DON'T BE A "COUCH POTATO")

Increasing the ability of your body to use oxygen as well as possible is directly related to the frequency (how often), duration (how long), and intensity (how hard) you exercise. You can increase your VO_2 max anywhere from 5 to 30%. If your first oxygen level is low, you can make some large improvements. If you are already active you may not make as big a gain but you shouldn't lose either (ACSM, 1995).

	HR_{max}	HR_{rest}	Blood Pressure	VO_2 max	Target HR Range
Date _____					
Date _____					
Date _____					
Date _____					

Your target heart rate range is figured out by the formula below:

Target HR Range = [(HR_{max} - HR_{rest}) x 0.50 and 0.85] + HR_{rest}

During exercise your goal should be to keep your heart rate (HR) in the target heart rate range.

HR_{max} = Maximum heart rate

HR_{rest} = Resting heart rate

Attachment 7a

Precontemplation Instruction Sheet

Stage 1

Thinking About Being More Physically Active

Sandra's Story

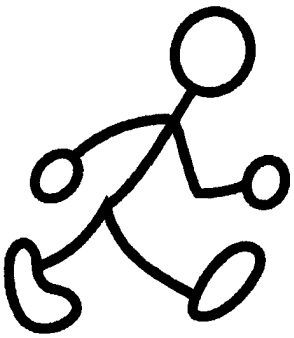
Precontemplation

Thank you for completing the aerobic assessment and the questionnaires. Your willingness to be in this study is certainly appreciated and I want to congratulate you on being officially entered into the Physical Activity Modification Program (PAMP). Today I will give you some information to take home, to read, and to think about.

First I want you to know that becoming more active isn't easy. Surely that's how Sandra Johnson felt. At the age of 45, Sandra was overweight and had high blood pressure. Last March, however, this all began to change. The turning point occurred during a family trip to Washington, DC. While on the trip, Sandra had tried to walk up the stairs in front of the Lincoln Memorial. However, she was unable to make it to the top. Breathing heavily, she rested for a few minutes and then walked back down the stairs she had climbed and waited for her family. It was at that moment that Sandra decided to do something about her health and fitness. What she decided to do was begin a Physical Activity Modification Program.

It is now over one year and Sandra is still involved in her Living with Exercise Program I asked her what led to her success. She said, "First and foremost, I began to think about becoming more physically active. I felt so embarrassed about what happened at the Lincoln Memorial. I never wanted anything like that to happen again. I talked to my doctor about what I should do and she recommended I start walking more often.

That same day, and everyday for the next two-weeks, I took a 5-10 minute walk after dinner. It wasn't easy, but I kept it up. During the third and fourth weeks, I walked 5-10 minutes at lunchtime and after dinner. Over the past year, I have increased the frequency of my 5-10 minute walks and now average 30-45 total minutes of walking a day. I really feel good!"



Let's Begin

In this next section, please take a moment to list all the benefits and drawbacks you can think of for or against adopting more physical activity into your life. I'll help you get started by listing a few from Sandra's list:

Benefits of Activity	Drawbacks of Activity
1. Improve Health	1. Too much Work
2. Feel Better about Self	2. Is Boring
3. Look Better	3. Is Embarrassing
4. _____	4. _____
5. _____	5. _____
6. _____	6. _____

The list you have just made is very powerful. It's gotten you to think about the Physical Activity Modification Program. In doing so, it has helped you move toward "Clarifying Your Thoughts about Being More Physically Active" which is the next stage of change. You may need more time before you begin the Physical Activity Modification Program, but at least you are thinking about it. CONGRATULATIONS! YOU CAN DO IT! (Cardinal, 1993).

Read More About It

In the next few weeks I would like you to read the following information:

- Living with Exercise.
  Introduction, pages 1-10, and Chapter 1, pages 11-30

- Building Your Activity Pyramid
  Pages 5-11 & 37-38

These are comprehensive books designed to help you become more physically active; they are yours to keep. Writing in these books is essential to your progress in adopting a more physically active lifestyle. Please **DO** complete the exercises as they are presented. I will call you in about 4 weeks to see how you are doing. Please feel free to progress at whatever pace you feel most comfortable with.

Call for Questions or Concerns

Please call me or e-mail me if you have any questions or concerns. Good Luck.

Mary Nelson:
301-434-5514 msnelson@erols.com

Attachment 7b

Contemplation Instruction Sheet

Stage 2

Clarifying Your Thoughts About Being More Physically Active

Contemplation

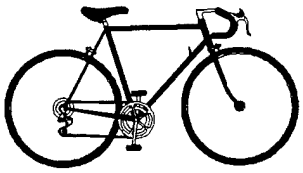
Don't take my word for it

Thank you for completing the aerobic assessment and the questionnaires. Your willingness to be in this study is certainly appreciated and I want to congratulate you on being officially entered into the Physical Activity Modification Program (PAMP). Today I will be giving you some information to take home, to read, and to think about.

Who knows you might be just a few minutes away from your first 2-minute walk. In fact by the end of today, you might easily accumulate 5 or 10 minutes of walking and climb up 2 or 3 flights of stairs! That's the beauty of the Physical Activity Modification Program. Don't take my word for it. See for yourself.

Below, try to list some lifestyle physical activities that you'd like to try out and think you can do. I'll offer a few of my own thoughts to help you get started. Before we get started though, stop reading, stand up, and take a 2 minute walk.

Wasn't that refreshing? Now let's get started on building even more physical activity into your daily routine.



I Usually Do This ....
Read my mail sitting down
Ride the elevator
Ride a power lawn mower
Drive my car
Telephone people
Use the dishwasher

_____
_____
_____
_____
_____

But I Could Do This ....
Read mail while I pace
Take the stairs
Use a push lawn mower
Walk or ride a bike
Walk to see them
Wash dishes by hand

_____
_____
_____
_____
_____

How Did You Do? It's Not Ever Too Late

By the way for those of you who followed the 2 minute walk recommendation given above, CONGRATULATIONS! You are now in the "Getting Started Stage of Change". If you didn't take a 2 minute walk, it's not too late to do it now. Go ahead, I'll wait.

Wasn't it easy? What could possibly keep you from sticking to the Physical Activity Modification Program you have just begun?
The list you have just made is very powerful. It has helped you move toward the stage of "Getting Started". Why not follow your own advice? YOU CAN DO IT (Cardinal, 1993)!

Read More About It

In the next few weeks I would like you to read the following information:

- Living with Exercise.
  Introduction, pages 1-10
  Chapter 1 "Thinking About It", pages 11-30
  Chapter 2 "Becoming Committed", pages 31-50

- Building Your Activity Pyramid
  Pages 5-22 & 37-38

These are comprehensive books designed to help you become more physically active; they are yours to keep. Writing in these books is essential to your progress in adopting a more physically active lifestyle. Please **DO** complete the exercises as they are presented. I will call you in about 2 weeks to see how you are doing. Please feel free to progress at whatever pace you feel most comfortable with.

Call For Questions or Concerns

Please call me or e-mail me if you have any questions or concerns. Good Luck.

Mary Nelson:
301-434-5514 msnelson@erols.com

Attachment 7c

Preparation Instruction Sheet

Stage 3

Getting Started



Preparation

S.M.A.R.T.

Thank you for completing the aerobic assessment and the questionnaires. Your willingness to be in this study is certainly appreciated and I want to congratulate you on being officially entered into the Physical Activity Modification Program (PAMP). Today I will be giving you some information to take home, to read, and to think about.

Sometimes when you're ready to get started to increase your physical activity level you need a little help clarifying what you want. To help you do this, a process known as S.M.A.R.T. goal setting is used. S.M.A.R.T. goal setting is a method of making your goals Specific, Measurable, Action-oriented, Realistic, and Timed.

S.M.A.R.T. goal setting begins with a written plan. Goals that are written down are more likely to be achieved.

Begin by thinking about what you Specifically want to do. For example, "I want to walk 30 total minutes each day this week." Next think about how this could be Measured. A simple way of measuring this goal would be to keep a log of your daily walking time. Third, you want to phrase the goal in an Action-oriented manner. For example, "I am walking 30 total minutes each day this week." Now that you have written your goal down, check to see that it is Realistic. Try not to be too hard or easy on yourself. The last part of the S.M.A.R.T. plan has to do with Time. In the above goal, the part that says "30 total minutes each day this week," is the timed part.

The above goal is a process goal. Process goals tell you what to do. Another kind of goal is a product goal. Product goals focus on outcomes you expect to occur as a result of your actions. An example of a product goal might be, "To lower my resting heart rate by 5 beats over the next 16 weeks." Sometimes "product goals" sound more like "wishes." For now I ENCOURAGE YOU TO WRITE PROCESS TYPE GOALS and to begin each goal with the words, "I am ..."

S.M.A.R.T. Goals

My S.M.A.R.T. physical activity goals are:

1. _____.

2. _____.

3. _____.

Try to read over your goals at least once each day. If you find your goals to be too easy or too hard, adjust them up or down as needed. You may wish to revise them every month or so.

S.M.A.R.T. goal setting is a very powerful behavior change technique. By writing your S.M.A.R.T. goals down, you have created an action plan for change. This action plan will help move you to the "Sticking with It" stage of change. YOU CAN DO IT

Read More About It

In the next few weeks I would like you to read the following information:

- Living with Exercise.
  - Introduction, pages 1-10
  - Chapter 1 "Thinking About It", pages 11-30
  - Chapter 2 "Becoming Committed", pages 31-50
  - Chapter 3 "Getting Started", pages 51-64
- Building Your Activity Pyramid
  - Pages 5-22 & 37-38

These are comprehensive books designed to help you become more physically active; they are yours to keep. Writing in these books is essential to your progress in adopting a more physically active lifestyle. Please **DO** complete the exercises as they are presented. I will call you in about 2 weeks to see how you are doing. Please feel free to progress at whatever pace you feel most comfortable with.

Call for Questions or Concerns

Please call me or e-mail me if you have any questions or concerns. Good Luck.

Mary Nelson:
301-434-5514 msnelson@erols.com

Attachment 7d

Action Instruction Sheet

Stage 4

Sticking With It

Relapse?

Thank you for completing the aerobic assessment and the questionnaires. Your willingness to be in this study is certainly appreciated and I want to congratulate you on being officially entered into the Physical Activity Modification Program (PAMP). Today I will be giving you some information to take home, to read, and to think about.

GREAT – you're physically active on a regular basis. That means you've cleared the first hurdle (i.e., begun a program). The purpose here is to help you clear the second hurdle (i.e., sticking with your program). This is what people at this point need the most help with. In fact, research shows that of those people who begin a regular physical activity program, about half end up dropping out (i.e., relapsing) within the first few months. To help you avoid this, some special relapse prevention techniques will be described.

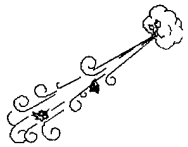
The process of relapse begins with just one missed physical activity session. Your response to this missed session is important.

For example, let's say that you are planning to walk 20 minutes today during lunch. When your lunchtime arrives, you notice that it's cold and wet outside. You hadn't planned on bad weather. You decide to skip your walk today. If this only happens once, you have lapsed. An occasional lapse is OK. It is not a failure. In fact, it might be a healthy change-of-pace (especially if it is planned). If you repeatedly miss your walks, you are showing signs of relapse behavior. If you find yourself relapsing, try to stop it before it becomes collapse (i.e., giving up physical activity entirely). One way of doing this is to train yourself to think, "I am always physically active at least every 3rd day (unless I am ill)."

If you do lapse, relapse, or collapse, don't be too hard on yourself. Instead, try to view each instance as an opportunity to learn more about yourself. For example, identify what situation(s) "caused" this to happen. By knowing this, you can plan to counteract these situations in the future. Advanced planning and learning from the past are important aspects of relapse prevention.

At this point, please try to think of some situations that make it hard for you to be physically active. Then try to think of some strategies you might use in each instance.

Action



Potential Situation

1.

2.

3.

4.

Strategies I'll Use/Try

1.

2.

3.

4.

Next, think about the strengths and weaknesses of each strategy you have listed. Are they workable? Can anyone you know assist you? How might they help you?

The list you have just made is very powerful. It will help you move to "Maintaining an Acceptable Level of Activity" the next stage of change. YOU CAN DO IT (Cardinal, 1993)!

Read More About It

In the next few weeks I would like you to read the following information:

- Living with Exercise.
  - Introduction, pages 1-10
  - Chapter 1 "Thinking About It", pages 11-30
  - Chapter 2 "Becoming Committed", pages 31-50
  - Chapter 3 "Getting Started", pages 51-64
  - Chapter 4 "Making Progress", pages 64-72
  - Chapter 7 "Keep It Up", pages 91-98
- Building Your Activity Pyramid
  - Pages 5-50

These are comprehensive books designed to help you become more physically active; they are yours to keep. Writing in these books is essential to your progress in adopting a more physically active lifestyle. Please **DO** complete the exercises as they are presented. I will call you in about 2 weeks to see how you are doing. Please feel free to progress at whatever pace you feel most comfortable with.

The Exercise Prescription

I am going to give you an exercise prescription today based on your aerobic fitness level, and we will complete a physical activity contract together. The exercise prescription is designed to enhance your physical fitness program. The purpose of the exercise prescription is to give you a professional estimation of the frequency, time, and intensity of exercise that will further improve your heart health. The greatest improvement in heart health occurs when exercise involves the use of large muscle groups over prolonged periods and is rhythmic and aerobic in nature (e.g. walking, hiking, running, machine-based stair climbing, swimming, cycling, rowing, cross-country skiing, or rope skipping). Intensity and duration of exercise determine the total caloric expenditure during an exercise session, and are closely related. That is, similar increases in heart health may be achieved by a low intensity, long duration session as well as a higher intensity, shorter duration session. Since you have a higher than average level of heart health you can exercise at 60 – 90% of your maximum heart rate. You want to aim for an average heart rate close to the middle of your prescribed range. Your exercise session should last between 20-60 minutes not including time spent warming up and cooling down. You should exercise 3-5 times per week. If you are interested in the number of calories you expend in activity the following is a useful formula:

METs X 3.5 ml oxygen for each MET X body weight in kg / 200 = kcal/min (ACSM, 1995)
For example if the activity uses 4 METS and you do it for 30 minutes (you weigh 75 kg) then
4 METS X 3.5 ml oxygen X 75 Kg / 200 = 5.25 kcal/min
therefore 5.25 kcal/min X 30 min = 157.5 kcal

GOOD LUCK

Call for Questions or Concerns

Please call me or e-mail me if you have any questions or concerns. Good Luck.

Mary Nelson:
301-434-5514 msnelson@erols.com

STICKING

Attachment 7e

Maintenance Instruction Sheet

Stage 5

Maintaining an Acceptable Level of Activity

The Habit

Thank you for completing the aerobic assessment and the questionnaires. Your willingness to be in this study is certainly appreciated and I want to congratulate you on being officially entered into the Physical Activity Modification Program (PAMP). Today I will be giving you some information to take home, to read, and to think about.

CONGRATULATIONS! You've got the physical activity habit! Since you have the habit, our focus will be on helping you maintain your habit during "hard times." A "hard time" might occur when your normal routine is disrupted (e.g., travel, vacation). The way you deal with these hard times is important. Doing some advanced planning and having a strong "physical activity identity" can help.

For example, a friend of mine always carries a sports bag with her on trips. She has been doing this for almost five years. The bag is packed with all the things she needs to be physically active (e.g., walking shoes, jump rope). People who know her often say things like, "I see you still have that old sports bag so you must still be exercising." Even people who don't know her will assume she is an exerciser, because of the sports bag, and talk to her about everything from aerobic dance to zinc supplements. The bag has really become a part of her identity. We'll call this her "physical activity identity."

People with a strong physical activity identity find it difficult to not be physically active. No matter how hard the situation may seem, these people almost always find a way to exercise. How strong is your physical active identity? Are you able to foresee and plan ahead for hard times?

Consider each of the following disruptive situations. Next to each situation try to list what you could do to keep yourself physically active.

Even if physical activity is a natural part of your life, some situations might force you to miss your planned exercise sessions (e. g., illness). If this happens to you, try to set a "return to physical activity" date for yourself and stick to it. Don't let a temporary situation permanently keep you inactive.

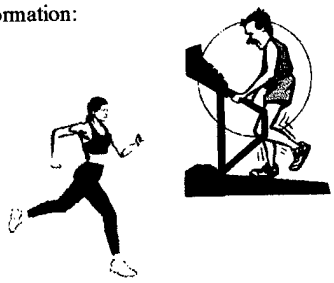
Maintenance

The list you have just made is powerful. It will help keep you in the stage of "Maintaining An Acceptable Level of Activity". YOU CAN DO IT (Cardinal, 1993)!

Disruptive Situation	I could ...
Two week vacation	_____
Busy and hectic holiday season	_____
Extra busy at work or home	_____
Houseguests visit for one week	_____
Suffer an ankle injury	_____

Read More About It

In the next few weeks I would like you to read the following information:



- Living with Exercise.
  - Introduction, pages 1-10
  - Chapter 1 "Thinking About It", pages 11-30
  - Chapter 2 "Becoming Committed", pages 31-50
  - Chapter 3 "Getting Started", pages 51-64
  - Chapter 4 "Making Progress", pages 64-72
  - Chapter 7 "Keep It Up", pages 91-98
  - Chapter 9 "The Final Touch", pages 105-110
- Building Your Activity Pyramid
  - Pages 5-50

These are comprehensive books designed to help you become more physically active; they are yours to keep. Writing in these books is essential to your progress in adopting a more physically active lifestyle. Please **DO** complete the exercises as they are presented. I will call you in about 2 weeks to see how you are doing. Please feel free to progress at whatever pace you feel most comfortable with.

The Exercise Prescription

I am going to give you an exercise prescription today based on your aerobic fitness level, and we will complete a physical activity contract together. The exercise prescription is designed to enhance your physical fitness program. The purpose of the exercise prescription is to give you a professional estimation of the frequency, time, and intensity of exercise that will further improve your heart health. The greatest improvement in heart health occurs when exercise involves the use of large muscle groups over prolonged periods and is rhythmic and aerobic in nature (e.g. walking, hiking, running, machine-based stair climbing, swimming, cycling, rowing, cross-country skiing, or rope skipping). Intensity and duration of exercise determine the total caloric expenditure during an exercise session, and are closely related. That is, similar increases in heart health may be achieved by a low intensity, long duration session as well as a higher intensity, shorter duration session. Since you have a higher than average level of heart health you can exercise at 60 – 90% of your maximum heart rate. You want to aim for an average heart rate close to the middle of your prescribed range. Your exercise session should last between 20-60 minutes not including time spent warming up and cooling down. You should exercise 3-5 times per week. If you are interested in the number of calories you expend in activity the following is a useful formula:

METs X 3.5 ml oxygen for each MET X body weight in kg / 200 = kcal/min (ACSM, 1995)
For example if the activity uses 4 METS and you do it for 30 minutes (you weigh 75 kg) then
4 METS X 3.5 ml oxygen X 75 Kg / 200 = 5.25 kcal/min

Call for Questions or Concerns

Please call me or e-mail me if you have any questions or concerns. Good Luck.

Mary Nelson:
301-434-5514 msnelson@erols.com

Attachment 8

Counseling Techniques

Precontemplation

1. Assess and clarify the participant's knowledge, beliefs and concerns about physical activity. Ask them what they see as the potential personal benefits of physical activity and what they feel are two of the biggest reasons for their inactivity. How could these roadblocks be handled?
2. Advise the participant by providing personalized information on the benefits of physical activity, give personalized messages about risk, address feelings and provide support. Increase the participant's awareness of the benefits of exercise and encourage them to think about becoming active, use living with exercise pg. 11-14 as a guide.
3. Assist by being understanding, provide praise and support for new thoughts about increased activity. Target perceived behavioral control and attitude. Increase the participant's awareness of the need to exercise, use Living with Exercise pg. 23-30 as a guide. Interventions should target accessibility to resources and opportunities, i.e. HAWC (Health and Wellness Center).

Contemplation/Preparation

1. Assess and clarify the participant's knowledge, beliefs and concerns about physical activity. Praise their interest in thinking about increasing physical activity, acknowledge and reinforce the participant's reasons for wanting to become more active, identify remaining barriers to activity, help to overcome barriers, elicit participant's preferences and negotiate initial steps toward exercise.
2. Advise the participant by identifying available resources and supports. Provide opportunities and access to resources that will foster the participants' perception of having control over their own physical environment. Offer a tour of the hawc. Discuss the manual living with exercise and encourage use of this valuable resource. Educate participants that increased heart rate, sweating and faster breathing are all signs of a successful workout, not that something is wrong.
3. Assist by being understanding, provide praise and support for new thoughts about increased activity. Help to set realistic goals. Discuss clothing, footwear, and equipment and exercise possibilities at home. Suggest easy to do, pleasant, and entertaining exercise activities such as walking or other low-cost recreation.
4. Congratulate participants for wanting to increase their physical activity. Have each person list two main benefits of their activity program. Participants should be asked to list activities they enjoy and where and when they will do them. They should also identify a family member, friend or coworker who will support their new activity program. The more specific the person can be the better.
5. Continue with positive reinforcement. Discuss participant's feelings about the act of exercising and how they feel afterwards. Also discuss how it feels if they do not exercise and whether they believe they think they can make a permanent commitment to increased activity and exercise. Find out what makes it easy in the environment to exercise and what makes it hard. What exercise behaviors can be substituted for non-exercise behaviors? How can they remind themselves to exercise? Talk about available resources such as the Health and Wellness Center (HAWC).

Action/Maintenance

1. Assess and clarify the participants' knowledge, beliefs and concerns about physical activity. Discuss current exercise habits, set new goals and review physical activity contracts, write new ones if necessary.
2. Advise the participant by identifying available resources and supports such as the hawc. Discuss creative ways to maintain exercise program while traveling or when other barriers present themselves. Discuss the manual "living with exercise" and encourage use of this valuable resource. Discuss clothing, footwear, and equipment and exercise possibilities at home. Suggest easy to do, pleasant, and entertaining exercise activities such as walking or other low-cost recreation. Remind subjects that increased heart rate, sweating and faster breathing are all signs of a successful workout, not that something is wrong.
3. Assist by being understanding; provide praise and support for current activity. Introduce the idea of consequences for taking steps either to exercise or not exercise. Form buddy systems for those interested in supporting others in their exercise programs. Offer information about local events to participate in.

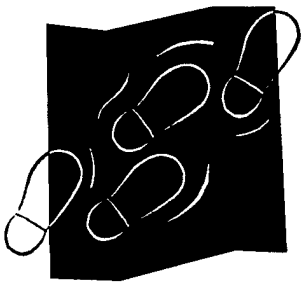
Control Group

1. Are you able to exercise according to the exercise prescription you received?
2. What do you think about the effects of exercise on your appetite?
3. What do you think about the affects of exercise on your mood?
4. How do you feel after you exercise?

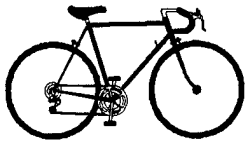
Attachment 9a

Precontemplation to Contemplation Update

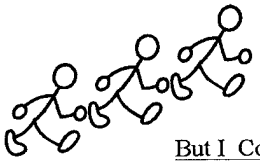
Clarifying Your Thoughts About Being More Physically Active



Stage 2



Moving Right Along



Congratulations on your progress in adopting more physical activity into your life, you're doing great.

Who knows you might be just a few minutes away from your first 2-minute walk. In fact by the end of today, you might easily accumulate 5 or 10 minutes of walking and climb up 2 or 3 flights of stairs! That's the beauty of the Physical Activity Modification Program. Don't take my word for it. See for yourself.

Below, try to list some lifestyle physical activities that you'd like to try out and think you can do. I'll offer a few of my own thoughts to help you get started. Before we get started though, stop reading, stand up, and take a 2 minute walk.

Wasn't that refreshing? Now let's get started on building even more physical activity into your daily routine.

I Usually Do This	But I Could Do This ....
Read my mail sitting down	Read mail while I pace
Ride the elevator	Take the stairs
Ride a power lawn mower	Use a push lawn mower
Drive my car	Walk or ride a bike
Telephone people	Walk to see them
Use the dishwasher	Wash dishes by hand
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

By the way for those of you who followed the 2 minute walk recommendation given above, CONGRATULATIONS! You are now in the "Getting Started Stage of Change". If you didn't take a 2 minute walk, it's not too late to do it now. Go ahead, I'll wait.

Wasn't it easy? What could possibly keep you from sticking to the Physical Activity Modification Program you have just begun?

The list you have just made is very powerful. It has helped you move toward the stage of "Getting Started". Why not follow your own advice? YOU CAN DO IT! (Cardinal, 1993)

Hopefully you have already begun to read the materials given to you earlier.

Your next reading should include:

Living With Exercise

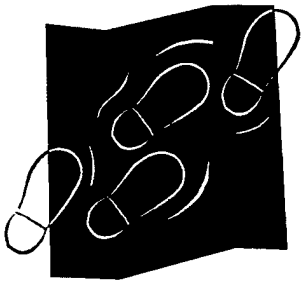
- Chapter 1 "Thinking About It", pages 11-30, and
- Chapter 2 "Becoming Committed" pages 31-50,

Keep up the great work and Good Luck.

Attachment 9b

Contemplation to Preparation Update

Getting Started



Stage 3

Moving Right Along

Congratulations on your progress in adopting more physical activity into your life, you're doing great.

Sometimes when you're ready to get started to increase your physical activity level you need a little help clarifying what you want. To help you do this, a process known as S.M.A.R.T. goal setting is used. S.M.A.R.T. goal setting is a method of making your goals Specific, Measurable, Action-oriented, Realistic, and Timed.

S.M.A.R.T. goal setting begins with a written plan. Goals that are written down are more likely to be achieved. Begin by thinking about what you Specifically want to do. For example, "I want to walk 30 total minutes each day this week." Next think about how this could be Measured. A simple way of measuring this goal would be to keep a log of your daily walking time. Third, you want to phrase the goal in an Action-oriented manner. For example, "I am walking 30 total minutes each day this week." Now that you have written your goal down, check to see that it is Realistic.

MY S.M.A.R.T. physical activity goals are:

1. _____.
2. _____.
3. _____.

Try not to be too hard or easy on yourself. The last part of the S.M.A.R.T. plan has to do with Time. In the above goal, the part that says "30 total minutes each day this week," is the timed part.

The above goal is a process goal. Process goals tell you what to do. Another kind of goal is a product goal. Product goals focus on outcomes you expect to occur as a result of your actions. An example of a product goal might be, "To lower my resting heart rate by 5 beats over the next 16 weeks." Sometimes "product goals" sound more like "wishes." For now I ENCOURAGE YOU TO WRITE PROCESS TYPE GOALS and to begin each goal with the words, "I am ..."

Try to read over your goals at least once each day. If you find your goals to be too easy or too hard, adjust them up or down as needed. You may wish to revise them every month or so.

S.M.A.R.T. goal setting is a very powerful behavior change technique. By writing your S.M.A.R.T. goals down, you have created an action plan for change. This action plan will help move you to the "Sticking with It" stage of change. YOU CAN DO IT! (Cardinal, 1993).

Hopefully you have already begun to read the materials given to you earlier.

Your next reading should include:

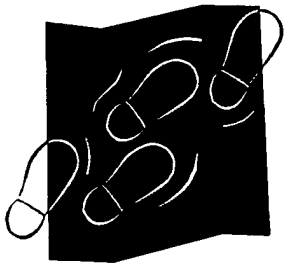
Living with Exercise

- Chapter 3, "Getting Started" pages 51-64.

Attachment 9c

Preparation to Action Update

Sticking With It



Stage 4

Moving Right Along

Congratulations on your progress in adopting more physical activity into your life, you're doing great.

GREAT – you're physically active on a regular basis. That means you've cleared the first hurdle (i.e., begun a program). The purpose here is to help you clear the second hurdle (i.e., sticking with your program). This is what people at this point need the most help with. In fact, research shows that of those people who begin a regular physical activity program, about half end up dropping out (i.e., relapsing) within the first few months. To help you avoid this, some special relapse prevention techniques will be described.

The process of relapse begins with just one missed physical activity session. Your response to this missed session is important. For example, let's say that you are planning to walk 20 minutes today during lunch. When your lunchtime arrives, you notice that it's cold and wet outside. You hadn't planned on bad weather. You decide to skip your walk today. If this only happens once, you have lapsed. An occasional lapse is OK. It is not a failure. In fact, it might be a healthy change-of-pace (especially if it is planned). If you repeatedly miss your walks, you are showing signs of relapse behavior. If you find yourself relapsing, try to stop it before it becomes collapse (i.e., giving up physical activity entirely). One way of doing this is to train yourself to think, "I am always physically active at least every 3rd day (unless I am ill)."

If you do lapse, relapse, or collapse, don't be too hard on yourself. Instead, try to view each instance as an opportunity to learn more about yourself. For example, identify what situation (s) "caused" this to happen. By knowing this, you can plan to counteract these situations in the future. Advanced planning and learning from the past are important aspects of relapse prevention.

At this point, please try to think of some situations that make it hard for you to be physically active. Then try to think of some strategies you might use in each instance.

Potential Situation

1.

2.

3.

4.

Strategies I'll Use/Try

1.

2.

3.

4.

Next, think about the strengths and weaknesses of each strategy you have listed. Are they workable? Can anyone you know assist you? How might they help you?

The list you have just made is very powerful. It will help you move to "Maintaining an Acceptable Level of Activity" the next stage of change. YOU CAN DO IT! (Cardinal, 1993)

Hopefully you have already begun to read the materials given to you earlier.

Your next reading should include:
Living with Exercise.

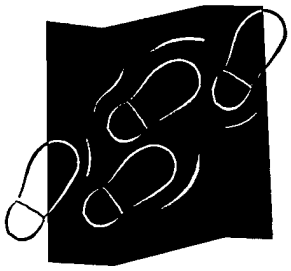
- Chapter 4 "Making Progress" pages 64-72,
- Chapter 7 "Keep It Up" pages 91-98,

Building Your Activity Pyramid

- Pages 39-50

Attachment 9d
Action to Maintenance Update

Maintaining an Acceptable Level of Activity



Stage 5

Moving Right Along

Congratulations on your progress in adopting more physical activity into your life, you're doing great.

CONGRATULATIONS! You've got the physical activity habit! Since you have the habit, our focus will be on helping you maintain your habit during "hard times." A "hard time" might occur when your normal routine is disrupted (e.g., travel, vacation). The way you deal with these hard times is important. Doing some advanced planning and having a strong "physical activity identity" can help.

For example, a friend of mine always carries a sports bag with her on trips. She has been doing this for almost five years. The bag is packed with all the things she needs to be physically active (e.g., walking shoes, jump rope). People who know her often say things like, "I see you still have that old sports bag so you must still be exercising." Even people who don't know her will assume she is an exerciser, because of the sports bag, and talk to her about everything from aerobic dance to zinc supplements. The bag has really become a part of her identity. We'll call this her "physical activity identity."

People with a strong physical activity identity find it difficult to not be physically active. No matter how hard the situation may seem, these people almost always find a way to exercise. How strong is your physically active identity? Are you able to foresee and plan ahead for hard times?

Consider each of the following disruptive situations. Next to each situation try to list what you could do to keep yourself physically active.

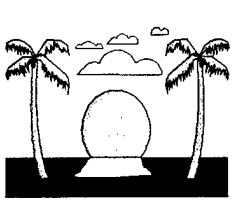
Even if physical activity is a natural part of your life, some situations might force you to miss your planned exercise sessions (e.g., illness). If this happens to you, try to set a "return to physical activity" date for yourself and stick to it. Don't let a temporary situation permanently keep you inactive.

The list you have just made is powerful. It will help keep you in the stage of "Maintaining An Acceptable Level of Activity". YOU CAN DO IT! (Cardinal, 1993)

Hopefully you have already begun to read the materials given to you earlier.

Your next reading should include:
Living with Exercise.

- Chapter 9 "The Final Touch" pages 105-110



Disruptive Situation	I could ...
Two week vacation	_____
Busy and hectic holiday season	_____
Extra busy at work or home	_____
Houseguests visit for one week	_____
Suffer an ankle injury	_____

Attachment 10

Energy Calculation Instructions

METS

Classification by Energy Cost of Human Physical Activities

Background & Instructions

This classification of physical activities by energy cost is a very valuable tool and a fantastic reference to have. It required a great deal of research to produce. It is based on a measurement known as a MET. A MET is a metabolic equivalent which is a unit of measure; one MET is resting metabolism. Clinicians often use the term MET to describe exercise intensity; activities are expressed in terms of multiples of the MET unit. One MET is the amount of energy expended during one minute of rest; it actually is equal to an oxygen use of 3.5 milliliters (ml) per kilogram (kg) of body weight per minute (min). For example, a person at rest who weighs 70 kg would use 70 kg X 3.5 ml's per min or 245 ml of oxygen per minute.

The amazing thing about the MET value is that it also equals the number of kcal the person uses per kg of body weight **per hour**. For example during a typical nights rest, if you weigh 70 kg, you use 70 kg x 1 MET x 8 hours or 560 kcal. Imagine if you increase your activity and were to walk for 30 minutes at 3 mph you would burn 123 kcals (70 kg x 3.5 METS X 0.5 hours). If you want to read more about this please see the Manual Living with Exercise , pages 31-34. I challenge you to try a few examples using the chart, your weight and different times. Time for activities is usually calculated to the nearest quarter hour (0.25, 0.50, 0.75, 1.0, 1.25, ...). Go ahead use this space to try some on your own; I'll help you get started:

I weigh 125 pounds which is 57 kg (125/2.2). *Remember there are 2.2 kilograms in every pound.* I scrubbed the kitchen floor today for 1.5 hours (that's a home activity). Looking in the chart I find the MET value for scrubbing floors on the second page under the category "Home activities"; it's the 23rd one down and uses 5.5 METS **per hour**. Let's calculate now: 57 kg X 5.5 METS X 1.5 hrs. = 470 kcal. Yeah for floor scrubbing!! Now you try one:

My weight in kg is _____

(weight in pounds ____ ÷ 2.2)

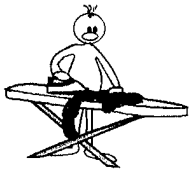
Activity MET value is _____

Amount of time to nearest quarter hour is _____

Results:

___ kg X ____ METS X ____ hrs = ____ total kcal

GREAT JOB



This classification of activity is from Ainsworth, Haskell, Leon, Jacobs, Montoye, & Paffenbarger (1993), *Medicine and Science in Sports and Exercise*, Vol. 25, No. 1, pp. 71-80.

Attachment 11

Energy Cost of Human Activities (Montoye et al., 1996)

Classification by Energy Cost of Human Physical Activities

Many of the values of this list and those added at the end came from the following sources: Bannister and Brown (1968); the 7-Day Recall Physical Activity Questionnaire (Blair et al., 1985); Durnin and Passmore (1967); Howley and Glover (1974); the American Health Foundation's Physical Activity List (Leon, 1981); McArdle, Katch, and Katch (1988); Passmore and Durnin (1955); Tecumseh Questionnaire (Reiff et al., 1967a, 1967b). Some values have been added from the following sources: Collins, Cureton, Hill, and Ray (1991); Geissler et al. (1981); Getchell (1968); Goff, Frassetto, and Specht (1956); Mandli, Hoffman, Jones, Bota, and Clifford (1989); Nelson, Pells, Geenen, and White (1988); Seliger (1968); Stray-Gundersen and Galanes (1991); Veicsteinas, Ferretti, Margonato, Rosa, and Tagliabue (1984); VonHofen, Auble, and Schwartz (1989); Watts, Martin, Schmeling, Silta, and Watts (1990); Wigaeus and Kilbom (1980).

Much of the data in this appendix is derived from actual measurement by indirect calorimetry. However, where data are not available, the figures are based on educated guesses. For some activities, the values are not the values obtained exclusively during execution of the activities. For example, folk dancing requires a higher value than that shown. However, in an hour of folk dancing, considerable time is spent standing, receiving directions, and so on, so the value shown represents the estimated average value. On the other hand, walking usually is done continuously, so its values represent the actual energy cost of doing the activity.

Adults (usually young adults) served as subjects in determining almost all of the metabolic costs of activities that have been reported in the literature. Little data is based on children and the elderly. The energy expended by children in kilocalories per kilogram of body weight in performing even common activities such as walking is significantly higher than when the same activities are done by adults (Montoye, 1982). This is probably because of children's greater ratio of surface area to body weight and poorer coordination than adults. Even if the resting energy expenditure is also higher in children, the MET values of activities in the table are probably a little low for children. Data from Torún (1983) have shown the same results. This has also been shown to be true for infants (Torún, Chew, & Mendoza, 1983). Data on energy cost of activities are needed to create a table for children like the one in this appendix.

Data on the energy cost of elderly adults are also needed. Although walking at the same rate may elicit an energy expenditure not much different than in young adults, the elderly generally walk slower, play tennis at less intensity, skate less vigorously, and the like, so the estimate of habitual energy expenditure in the elderly requires other energy cost values.

The numerical value on the left is the MET rating (the energy cost of the activity divided by resting energy expenditure). This MET value is approximately equal to the energy cost of the activity, expressed as kilocalories per hour per kilogram of body weight. For more detail on how to apply the values in the list, see Ainsworth et al., 1993.

From Ainsworth, B.E., Haskell, W.L., Leon, A.S., Jacobs, D.S., Jr., Montoye, H.J., Sallis, J.F., and Paffenbarger, R.S., Jr. (1993). Compendium of Physical Activities: Classification by Energy Costs of Human Physical Activities. *Medicine and Science in Sports and Exercise*, Vol. 25, No. 1, pp. 71-80.

Compendium of Physical Activities

METs	Activity category	Specific activity
8.5	Bicycling	Bicycling, BMX or mountain
4.0	Bicycling	Bicycling, <10 mph, general, leisure, to work or for pleasure
6.0	Bicycling	Bicycling, 10-11.9 mph, leisure, slow, light effort
8.0	Bicycling	Bicycling, 12-13.9 mph, leisure, moderate effort
10.0	Bicycling	Bicycling, 14-15.9 mph, racing or leisure, fast, vigorous effort
12.0	Bicycling	Bicycling, 16-19 mph, racing/not drafting or >19 mph drafting, very fast, racing general
16.0	Bicycling	Bicycling, >20 mph, racing, not drafting
5.0	Bicycling	Unicycling
5.0	Conditioning exercise	Bicycling, stationary, general
3.0	Conditioning exercise	Bicycling, stationary, 50 W, very light effort
5.5	Conditioning exercise	Bicycling, stationary, 100 W, light effort
7.0	Conditioning exercise	Bicycling, stationary, 150 W, moderate effort
10.5	Conditioning exercise	Bicycling, stationary, 200 W, vigorous effort
12.5	Conditioning exercise	Bicycling, stationary, 250 W, very vigorous effort
8.0	Conditioning exercise	Calisthenics (e.g., pushups, pullups, situps), heavy, vigorous effort
4.5	Conditioning exercise	Calisthenics, home exercise, light or moderate effort, general (example: back exercises), going up & down from floor
8.0	Conditioning exercise	Circuit training, general
6.0	Conditioning exercise	Weight lifting (free weight, nautilus or univeral-type), power lifting or body building, vigorous effort
5.5	Conditioning exercise	Health club exercise, general
6.0	Conditioning exercise	Stair-treadmill ergometer, general
9.5	Conditioning exercise	Rowing, stationary ergometer, general
3.5	Conditioning exercise	Rowing, stationary, 50 W, light effort
7.0	Conditioning exercise	Rowing, stationary, 100 W, moderate effort
8.5	Conditioning exercise	Rowing, stationary, 150 W, vigorous effort
12.0	Conditioning exercise	Rowing, stationary, 200 W, very vigorous effort
9.5	Conditioning exercise	Ski machine, general
6.0	Conditioning exercise	Slimnastics
4.0	Conditioning exercise	Stretching, hatha yoga
6.0	Conditioning exercise	Teaching aerobic exercise class
4.0	Conditioning exercise	Water aerobics, water calisthenics
3.0	Conditioning exercise	Weight lifting (free, nautilus or universal-type), light or moderate effort, light workout, general
1.0	Conditioning exercise	Whirlpool, sitting
6.0	Dancing	Aerobic, ballet or modern, twist
6.0	Dancing	Aerobic, general
5.0	Dancing	Aerobic, low impact
7.0	Dancing	Aerobic, high impact
4.5	Dancing	General
5.5	Dancing	Ballroom, fast (disco, folk, square)
3.0	Dancing	Ballroom, slow (e.g., waltz, foxtrot, slow dancing)
5.0	Fishing and hunting	Fishing, general
4.0	Fishing and hunting	Digging worms, with shovel
5.0	Fishing and hunting	Fishing from river bank and walking
2.5	Fishing and hunting	Fishing from boat, sitting
3.5	Fishing and hunting	Fishing from river bank, standing
6.0	Fishing and hunting	Fishing in stream, in waders
2.0	Fishing and hunting	Fishing, ice, sitting
2.5	Fishing and hunting	Hunting, bow and arrow or crossbow
6.0	Fishing and hunting	Hunting, deer, elk, large game
2.5	Fishing and hunting	Hunting, duck, wading
5.0	Fishing and hunting	Hunting, general
6.0	Fishing and hunting	Hunting, pheasants or grouse
5.0	Fishing and hunting	Hunting, rabbit, squirrel, prairie chick, raccoon, small game

2.5	Fishing and hunting	Pistol shooting or trap shooting, standing
2.5	Home activities	Carpet sweeping, sweeping floors
4.5	Home activities	Cleaning, heavy or major (e.g., wash car, wash windows, mop, clean garage), vigorous effort
3.5	Home activities	Cleaning, house or cabin, general
2.5	Home activities	Cleaning, light (dusting, straightening up, vacuuming, changing linen, carrying out trash), moderate effort
2.3	Home activities	Wash dishes-standing or in general (not broken into stand/walk components)
2.3	Home activities	Wash dishes: clearing dishes from table-walking
2.5	Home activities	Cooking or food preparation-standing or sitting or in general (not broken into stand/walk components)
2.5	Home activities	Serving food, setting table-implied walking or standing
2.5	Home activities	Cooking or food preparation-walking
2.5	Home activities	Putting away groceries (e.g., carrying groceries, shopping without a grocery cart)
8.0	Home activities	Carrying groceries upstairs
3.5	Home activities	Food shopping, with grocery cart
2.0	Home activities	Standing-shopping (non-grocery shopping)
2.3	Home activities	Walking-shopping (non-grocery shopping)
2.3	Home activities	Ironing
1.5	Home activities	Sitting, knitting, sewing, light wrapping (presents)
2.0	Home activities	Implied standing-laundry, fold or hang clothes, put clothes in washer or dryer, packing suitcase
2.3	Home activities	Implied walking-putting away clothes, gathering clothes to pack, putting away laundry
2.0	Home activities	Making bed
5.0	Home activities	Maple syruping/sugar bushing (including carrying buckets, carrying wood)
6.0	Home activities	Moving furniture, household
5.5	Home activities	Scrubbing floors, on hands and knees
4.0	Home activities	Sweeping garage, sidewalk or outside of house
7.0	Home activities	Moving household items, carrying boxes
3.5	Home activities	Standing-packing/unpacking boxes, occasional lifting of household items, light-moderate effort
3.0	Home activities	Implied walking-putting away household items-moderate effort
9.0	Home activities	Move household items upstairs, carrying boxes or furniture
2.5	Home activities	Standing-light (pump gas, change light bulb, etc.)
3.0	Home activities	Walking-light, noncleaning (ready to leave, shut/lock doors, close windows, etc.)
2.5	Home activities	Sitting-playing with child(ren)-light
2.8	Home activities	Standing-playing with child(ren)-light
4.0	Home activities	Walk/run-playing with child(ren)-moderate
5.0	Home activities	Walk/run-playing with child(ren)-vigorous
3.0	Home activities	Child care: sitting/kneeling-dressing, bathing, grooming, feeding, occasional lifting of child-light effort
3.5	Home activities	Child care: standing-dressing, bathing, grooming, feeding, occasional lifting of child-light effort
3.0	Home repair	Airplane repair
4.5	Home repair	Automobile body work
3.0	Home repair	Automobile repair
3.0	Home repair	Carpentry, general, workshop
6.0	Home repair	Carpentry, outside house, installing rain gutters
4.5	Home repair	Carpentry, finishing or refinishing cabinets or furniture
7.5	Home repair	Carpentry, sawing hardwood
5.0	Home repair	Caulking, chinking log cabin
4.5	Home repair	Caulking, except log cabin
5.0	Home repair	Cleaning gutters
5.0	Home repair	Excavating garage
5.0	Home repair	Hanging storm windows
4.5	Home repair	Laying or removing carpet
4.5	Home repair	Laying tile or linoleum
5.0	Home repair	Painting, outside house
4.5	Home repair	Painting, papering, plastering, scraping, inside house, hanging sheet rock, remodeling

METs	Activity category	Specific activity
3.0	Home repair	Put on and removal of tarp-sailboat
6.0	Home repair	Roofing
4.5	Home repair	Sanding floors with a power sander
4.5	Home repair	Scrape and paint sailboat or power boat
5.0	Home repair	Spreading dirt with a shovel
4.5	Home repair	Wash and wax hull of sailboat, car, powerboat, airplane
4.5	Home repair	Washing fence
3.0	Home repair	Wiring, plumbing
0.9	Inactivity, quiet	Lying quietly, reclining (watch television), lying quietly in bed-awake
1.0	Inactivity, quiet	Sitting quietly (riding in a car, listening to a lecture or music, watch television or a movie)
0.9	Inactivity, quiet	Sleeping
1.2	Inactivity, quiet	Standing quietly (standing in a line)
1.0	Inactivity, light	Recline-writing
1.0	Inactivity, light	Recline-talking or talking on phone
1.0	Inactivity, light	Recline-reading
5.0	Lawn and garden	Carrying, loading or stacking wood, loading/unloading or carrying lumber
6.0	Lawn and garden	Chopping wood, splitting logs
5.0	Lawn and garden	Clearing land, hauling branches
5.0	Lawn and garden	Digging sandbox
5.0	Lawn and garden	Digging, spading, filling garden
6.0	Lawn and garden	Gardening with heavypower tools, tilling a garden (see occupation, shoveling)
5.0	Lawn and garden	Laying crushed rock
5.0	Lawn and garden	Laying sod
5.5	Lawn and garden	Mowing lawn, general
2.5	Lawn and garden	Mowing lawn, riding mower
6.0	Lawn and garden	Mowing lawn, walk, hand mower
4.5	Lawn and garden	Mowing lawn, walk, power mower
4.5	Lawn and garden	Operating snow blower, walking
4.0	Lawn and garden	Planting seedlings, shrubs
4.5	Lawn and garden	Planting trees
4.0	Lawn and garden	Raking lawn
4.0	Lawn and garden	Raking roof with snow rake
3.0	Lawn and garden	Riding snow blower
4.0	Lawn and garden	Sacking grass, leaves
6.0	Lawn and garden	Shoveling, snow, by hand
4.5	Lawn and garden	Trimming shrubs or trees, manual cutter
3.5	Lawn and garden	Trimming shrubs or trees, power cutter
2.5	Lawn and garden	Walking, applying fertilizer or seeding a lawn
1.5	Lawn and garden	Watering lawn or garden, standing or walking
4.5	Lawn and garden	Weeding, cultivating garden
5.0	Lawn and garden	Gardening, general
3.0	Lawn and garden	Implied walking/standing-picking up yard, light
1.5	Miscellaneous	Sitting, card playing, playing board games
2.0	Miscellaneous	Standing-drawing (writing), casino gambling
1.3	Miscellaneous	Sitting-reading, book, newspaper, etc.
1.8	Miscellaneous	Sitting-writing, desk work
1.8	Miscellaneous	Standing-talking or talking on the phone
1.5	Miscellaneous	Sitting-talking or talking on the phone
1.8	Miscellaneous	Sitting-studying, general, including reading and/or writing
1.8	Miscellaneous	Sitting-in class, general, including note-taking or class discussion
1.8	Miscellaneous	Standing-reading
1.8	Music playing	Accordion
2.0	Music playing	Cello
2.5	Music playing	Conducting
4.0	Music playing	Drums

2.0	Music playing	Flute (sitting)
2.0	Music playing	Horn
2.5	Music playing	Piano or organ
3.5	Music playing	Trombone
2.5	Music playing	Trumpet
2.5	Music playing	Violin
2.0	Music playing	Woodwind
2.0	Music playing	Guitar, classial, folk (sitting)
3.0	Music playing	Guitar, rock and roll band (standing)
4.0	Music playing	Marching band, playing an instrument, baton twirling (walking)
3.5	Music playing	Marching band, drum major (walking)
4.0	Occupation	Bakery, general
2.3	Occupation	Bookbinding
6.0	Occupation	Building road (including hauling debris, driving heavy machinery)
2.0	Occupation	Building road, directing traffic (standing)
3.5	Occupation	Carpentry, general
8.0	Occupation	Carrying heavy loads, such as bricks
8.0	Occupation	Carrying moderate loads up stairs, moving boxes (16-40 pounds)
2.5	Occupation	Chambermaid
6.5	Occupation	Coal mining, drilling coal, rock
6.5	Occupation	Coal mining, erecting supports
6.0	Occupation	Coal mining, general
7.0	Occupation	Coal mining, shoveling coal
5.5	Occupation	Construction, outside, remodeling
3.5	Occupation	Electrical work, plumbing
8.0	Occupation	Farming, baling hay, cleaning barn, poultry work
3.5	Occupation	Farming, chasing cattle, nonstrenuous
2.5	Occupation	Farming, driving harvester
2.5	Occupation	Farming, driving tractor
4.0	Occupation	Farming, feeding small animals
4.5	Occupation	Farming, feeding cattle
8.0	Occupation	Farming, forking straw bales
3.0	Occupation	Farming, milking by hand
1.5	Occupation	Farming, milking by machine
5.5	Occupation	Farming, shoveling grain
12.0	Occupation	Fire fighter, general
11.0	Occupation	Fire fighter, climbing ladder with full gear
8.0	Occupation	Fire fighter, hauling hoses on ground
17.0	Occupation	Forestry, ax chopping, fast
5.0	Occupation	Forestry, ax chopping, slow
7.0	Occupation	Forestry, barking trees
11.0	Occupation	Forestry, carrying logs
8.0	Occupation	Forestry, felling trees
8.0	Occupation	Forestry, general
5.0	Occupation	Forestry, hoeing
6.0	Occupation	Forestry, planting by hand
7.0	Occupation	Forestry, sawing by hand
4.5	Occupation	Forestry, sawing, power
9.0	Occupation	Forestry, trimming trees
4.0	Occupation	Forestry, weeding
4.5	Occupation	Furriery
6.0	Occupation	Horse grooming
8.0	Occupation	Horse racing, galloping
6.5	Occupation	Horse racing, trotting
2.6	Occupation	Horse racing, walking
3.5	Occupation	Locksmith
2.5	Occupation	Maching tooling, machining, working sheet metal
3.0	Occupation	Machine tooling, operating lathe
5.0	Occupation	Machine tooling, operating punch press

METs	Activity category	Specific activity
4.0	Occupation	Machine tooling, tapping and drilling
3.0	Occupation	Machine tooling, welding
7.0	Occupation	Masonry, concrete
4.0	Occupation	Masseur, masseuse (standing)
7.0	Occupation	Moving, pushing heavy objects, 75 lbs or more (desks, moving van work)
2.5	Occupation	Operating heavy duty equipment/automated, not driving
4.5	Occupation	Orange grove work
2.3	Occupation	Printing (standing)
2.5	Occupation	Police, directing traffic (standing)
2.0	Occupation	Police, driving a squad car (sitting)
1.3	Occupation	Police, riding in a squad car (sitting)
8.0	Occupation	Police, making an arrest (standing)
2.5	Occupation	Shoe repair, general
8.5	Occupation	Shoveling, digging ditches
9.0	Occupation	Shoveling, heavy (more than 16 lbs · min^{-1})
6.0	Occupation	Shoveling, light (less than 10 lbs · min^{-1})
7.0	Occupation	Shoveling, moderate (10-15 lbs · min^{-1})
1.5	Occupation	Sitting-light office work, in general (chemistry lab work, light use of handtools, watch repair or micro-assembly, light assembly/repair)
1.5	Occupation	Sitting-meetings, general, and/or with talking involved
2.5	Occupation	Sitting: moderate (heavy levers, riding mower/forklift, crane operation)
2.5	Occupation	Standing: light (bartending, store clerk, assembling, filing, xeroxing, put up Christmas tree)
3.0	Occupation	Standing: light/moderate (assemble/repair heavy parts, welding, stocking, auto repair, pack boxes for moving, etc.), patient care (as in nursing)
3.5	Occupation	Standing: moderate (assembling at fast rate, lifting 50 lbs, hitch/twisting ropes)
4.0	Occupation	Standing: moderate/heavy (lifting more than 50 lb, masonry, painting, paper hanging)
5.0	Occupation	Steel mill, fettling
5.5	Occupation	Steel mill, forging
8.0	Occupation	Steel mill, hand rolling
8.0	Occupation	Steel mill, merchant mill rolling
11.0	Occupation	Steel mill, removing slag
7.5	Occupation	Steel mill, tending furnace
5.5	Occupation	Steel mill, tipping molds
8.0	Occupation	Steel mill, working in general
2.5	Occupation	Tailoring, cutting
2.5	Occupation	Tailoring, general
2.0	Occupation	Tailoring, hand sewing
2.5	Occupation	Tailoring, machine sewing
4.0	Occupation	Tailoring, pressing
6.5	Occupation	Truck driving, loading and unloading truck (standing)
1.5	Occupation	Typing, electric, manual or computer
6.0	Occupation	Using heavy power tools such as pneumatic tools (jackhammers, drills, etc.)
8.0	Occupation	Using heavy tools (not power) such as shovel, pick, tunnel bar, spade
2.0	Occupation	Walking on job, less than 2.0 mph (in office or lab area), very slow
3.5	Occupation	Walking on job, 3.0 mph, in office, moderate speed, not carrying anything
4.0	Occupation	Walking on job, 3.5 mph, in office, brisk speed, not carrying anything
3.0	Occupation	Walking, 2.5 mph, slowly and carrying light objects less than 25 lbs
4.0	Occupation	Walking, 3.0 mph, moderately and carrying light objects less than 25 lbs
4.5	Occupation	Walking, 3.5 mph, briskly and carrying objects less than 25 lbs
5.0	Occupation	Walking or walk downstairs or standing, carrying objects about 25–49 lbs
6.5	Occupation	Walking or walk downstairs or standing, carrying objects about 50–74 lbs
7.5	Occupation	Walking or walk downstairs or standing, carrying objects about 75–99 lbs
8.5	Occupation	Walking or walk downstairs or standing, carrying objects about 100 lbs and over
3.0	Occupation	Working in scene shop, theater actor, backstage, employee
6.0	Running	Job/walk combination (jobbing component of less than 10 min)

7.0	Running	Jogging, general
8.0	Running	Running, 5 mph (12 min · mile^{-1})
9.0	Running	Running, 5 mph (12 min · mile^{-1})
8.0	Running	Running, 5.2 mph (11.5 min · mile^{-1})
10.0	Running	Running, 6 mph (10 min · mile^{-1})
11.0	Running	Running, 6.7 mph (9 min · mile^{-1})
11.5	Running	Running, 7 mph (8.5 min · mile^{-1})
12.5	Running	Running, 7.5 mph (8 min · mile^{-1})
13.5	Running	Running, 8 mph (7.5 min · mile^{-1})
14.0	Running	Running, 8.6 mph (7 min · mile^{-1})
15.0	Running	Running, 9 mph (6.5 min · mile^{-1})
16.0	Running	Running, 10 mph (6 min · mile^{-1})
18.0	Running	Running, 10.9 mph (5.5 min · mile^{-1})
9.0	Running	Running, cross-country
8.0	Running	Running, general
8.0	Running	Running, in place
15.0	Running	Running, stairs, up
10.0	Running	Running, on a track, team practice
8.0	Running	Running, training, pushing wheelchair, marathon wheeling
3.0	Running	Running, wheeling, general
2.5	Self-care	Standing-getting ready for bed, in general
1.0	Self-care	Sitting on toilet
2.0	Self-care	Bathing (sitting)
2.5	Self-care	Dressing, undressing (standing or sitting)
1.5	Self-care	Eating (sitting)
2.0	Self-care	Talking and eating or eating only (standing)
2.5	Self-care	Sitting or standing-grooming (washing, shaving, brushing teeth, urinating, washing hands, put on make-up)
4.0	Self-care	Showering, toweling off (standing)
1.5	Sexual activity	Active, vigorous effort
1.3	Sexual activity	General, moderate effort
1.0	Sexual activity	Passive, light effort, kissing, hugging
3.5	Sports	Archery (nonhunting)
7.0	Sports	Badminton, competitive
4.5	Sports	Badminton, social singles and doubles, general
8.0	Sports	Basketball, game
6.0	Sports	Basketball, nongame, general
7.0	Sports	Basketball, officiating
4.5	Sports	Basketball, shooting baskets
6.5	Sports	Basketball, wheelchair
2.5	Sports	Billiards
3.0	Sports	Bowling
12.0	Sports	Boxing, in ring, general
6.0	Sports	Boxing, punching bag
9.0	Sports	Boxing, sparring
7.0	Sports	Broomball
5.0	Sports	Children's games (hopscotch, 4-square, dodgeball, playground apparatus, t-ball, tetherball, marbles, jacks, arcard games)
4.0	Sports	Coaching: football, soccer, basketball, baseball, swimming, etc.
5.0	Sports	Cricket (batting, bowling)
2.5	Sports	Croquet
4.0	Sports	Curling
2.5	Sports	Darts, wall or lawn
6.0	Sports	Drag racing, pushing or driving a car
6.0	Sports	Fencing
9.0	Sports	Football, competitive
8.0	Sports	Football, touch, flag, general
2.5	Sports	Football or baseball, playing catch
3.0	Sports	Frisbee playing, general

METs	Activity category	Specific activity
3.5	Sports	Frisbee, ultimate
4.5	Sports	Golf, general
5.5	Sports	Golf, carrying clubs
3.0	Sports	Golf, miniature, driving range
5.0	Sports	Golf, pulling clubs
3.5	Sports	Golf, using power cart
4.0	Sports	Gymnastics, general
4.0	Sports	Hacky sack
12.0	Sports	Handball, general
8.0	Sports	Handall, team
3.5	Sports	Hang gliding
8.0	Sports	Hockey, field
8.0	Sports	Hockey, ice
4.0	Sports	Horseback riding, general
3.5	Sports	Horseback riding, saddling horse
6.5	Sports	Horseback riding, trotting
2.5	Sports	Horseback riding, walking
3.0	Sports	Horseshoe pitching, quoits
12.0	Sports	Jai alai
10.0	Sports	Judo, jujitsu, karate, kick boxing, tae kwan do
4.0	Sports	Juggling
7.0	Sports	Kickball
8.0	Sports	Lacrosse
4.0	Sports	Moto-cross
9.0	Sports	Orienteering
10.0	Sports	Paddleball, competitive
6.0	Sports	Paddleball, casual, general
8.0	Sports	Polo
10.0	Sports	Racketball, competitive
7.0	Sports	Racketball, casual, general
11.0	Sports	Rock climbing, ascending rock
8.0	Sports	Rock climbing, rapelling
12.0	Sports	Rope jumping, fast
10.0	Sports	Rope jumping, moderate, general
8.0	Sports	Rope jumping, slow
10.0	Sports	Rugby
3.0	Sports	Shuffleboard, lawn bowling
5.0	Sports	Skateboarding
7.0	Sports	Skating, roller
3.5	Sports	Sky diving
10.0	Sports	Soccer, competitive
7.0	Sports	Soccer, casual, general
5.0	Sports	Softball or baseball, fast or slow pitch, general
4.0	Sports	Softball, officiating
6.0	Sports	Softball, pitching
12.0	Sports	Squash
4.0	Sports	Table tennis, ping pong
4.0	Sports	Tai chi
7.0	Sports	Tennis, general
6.0	Sports	Tennis, doubles
8.0	Sports	Tennis, singles
3.5	Sports	Trampoline
4.0	Sports	Volleyball, competitive, in gymnasium
3.0	Sports	Volleyball, noncompetitive; 6–9 member team, general
8.0	Sports	Volleyball, beach
6.0	Sports	Wrestling (one match = 5 min)

7.0	Sports	Wallyball, general
2.0	Transportation	Automobile or light truck (not a semi) driving
2.0	Transportation	Flying airplane
2.5	Transportation	Motor scooter, motor cycle
6.0	Transportation	Pushing plane in and out of hangar
3.0	Transportation	Driving heavy truck, tractor, bus
7.0	Walking	Backpacking, general
3.5	Walking	Carrying infant or 15-lb load (e.g., suitcase), level ground or downstairs
9.0	Walking	Carrying load upstairs, general
5.0	Walking	Carrying 1- to 15-lb load, upstairs
6.0	Walking	16- to 24-lb load, upstairs
8.0	Walking	Carrying 25- to 49-lb load, upstairs
10.0	Walking	Carrying 50- to 74-lb load, upstairs
12.0	Walking	Carrying 74+-lb load, upstairs
7.0	Walking	Climbing hills with 0- to 9-lb load
7.5	Walking	Climbing hills with 10- to 20-lb load
8.0	Walking	Climbing hills with 21- to 42-lb load
9.0	Walking	Climbing hills with 42+-lb load
3.0	Walking	Downstairs
6.0	Walking	Hiking, cross country
6.5	Walking	Marching, rapidly, military
2.5	Walking	Pushing or pulling stroller with child
6.5	Walking	Race walking
8.0	Walking	Rock or mountain climbing
8.0	Walking	Up stairs, using or climbing up ladder
4.0	Walking	Using crutches
2.0	Walking	Walking, less than 2.0 mph, level ground, strolling, household walking, very slow
2.5	Walking	Walking, 2.0 mph, level, slow pace, firm surface
3.0	Walking	Walking, 2.5 mph, firm surface
3.0	Walking	Walking, 2.5 mph, downhill
3.5	Walking	Walking, 3.0 mph, level, moderate pace, firm surface
4.0	Walking	Walking, 3.5 mph, level, brisk, firm surface
6.0	Walking	Walking, 3.5 mph, uphill
4.0	Walking	Walking, 4.0 mph, level, firm surface, very brisk pace
4.5	Walking	Walking, 4.5 mph, level, firm surface, very, very brisk
3.5	Walking	Walking, for pleasure, work break, walking the dog
5.0	Walking	Walking, grass track
4.0	Walking	Walking, to work or class
2.5	Water activities	Boating, power
4.0	Water activities	Canoeing, on camping trip
7.0	Water activities	Canoeing, portaging
3.0	Water activities	Canoeing, rowing, 2.0–3.9 mph, light effort
7.0	Water activities	Canoeing, rowing, 4.0–5.9 mph, moderate effort
12.0	Water activities	Canoeing, rowing, >6 mph, vigorous effort
3.5	Water activities	Canoeing, rowing, for pleasure, general
12.0	Water activities	Canoeing, rowing, in competition, or crew or sculling
3.0	Water activities	Diving, springboard or platform
5.0	Water activities	Kayaking
4.0	Water activities	Paddleboat
3.0	Water activities	Sailing, boat and board sailing, wind-surfing, ice sailing, general
5.0	Water activities	Sailing, in competition
3.0	Water activities	Sailing, Sunfish/Laser/Hobby Cat, keel boats, ocean sailing, yachting
6.0	Water activities	Skiing, water
7.0	Water activities	Skimobiling
12.0	Water activities	Skindiving or scuba diving as frogman
16.0	Water activities	Skindiving, fast
12.5	Water activities	Skindiving, moderate
7.0	Water activities	Skindiving, scuba diving, general
5.0	Water activities	Snorkeling

METs	Activity category	Specific activity
3.5	Sports	Frisbee, ultimate
4.5	Sports	Golf, general
5.5	Sports	Golf, carrying clubs
3.0	Sports	Golf, miniature, driving range
5.0	Sports	Golf, pulling clubs
3.5	Sports	Golf, using power cart
4.0	Sports	Gymnastics, general
4.0	Sports	Hacky sack
12.0	Sports	Handball, general
8.0	Sports	Handall, team
3.5	Sports	Hang gliding
8.0	Sports	Hockey, field
8.0	Sports	Hockey, ice
4.0	Sports	Horseback riding, general
3.5	Sports	Horseback riding, saddling horse
6.5	Sports	Horseback riding, trotting
2.5	Sports	Horseback riding, walking
3.0	Sports	Horseshoe pitching, quoits
12.0	Sports	Jai alai
10.0	Sports	Judo, jujitsu, karate, kick boxing, tae kwan do
4.0	Sports	Juggling
7.0	Sports	Kickball
8.0	Sports	Lacrosse
4.0	Sports	Moto-cross
9.0	Sports	Orienteering
10.0	Sports	Paddleball, competitive
6.0	Sports	Paddleball, casual, general
8.0	Sports	Polo
10.0	Sports	Racketball, competitive
7.0	Sports	Racketball, casual, general
11.0	Sports	Rock climbing, ascending rock
8.0	Sports	Rock climbing, rapelling
12.0	Sports	Rope jumping, fast
10.0	Sports	Rope jumping, moderate, general
8.0	Sports	Rope jumping, slow
10.0	Sports	Rugby
3.0	Sports	Shuffleboard, lawn bowling
5.0	Sports	Skateboarding
7.0	Sports	Skating, roller
3.5	Sports	Sky diving
10.0	Sports	Soccer, competitive
7.0	Sports	Soccer, casual, general
5.0	Sports	Softball or baseball, fast or slow pitch, general
4.0	Sports	Softball, officiating
6.0	Sports	Softball, pitching
12.0	Sports	Squash
4.0	Sports	Table tennis, ping pong
4.0	Sports	Tai chi
7.0	Sports	Tennis, general
6.0	Sports	Tennis, doubles
8.0	Sports	Tennis, singles
3.5	Sports	Trampoline
4.0	Sports	Volleyball, competitive, in gymnasium
3.0	Sports	Volleyball, noncompetitive; 6–9 member team, general
8.0	Sports	Volleyball, beach
6.0	Sports	Wrestling (one match = 5 min)

METs	Activity category	Specific activity
3.0	Water activities	Surfing, body or board
10.0	Water activities	Swimming laps, freestyle, fast, vigorous effort
8.0	Water activities	Swimming laps, freestyle, slow, moderate or light effort
8.0	Water activities	Swimming, backstroke, general
10.0	Water activities	Swimming, breaststroke, general
11.0	Water activities	Swimming, butterfly, general
11.0	Water activities	Swimming, crawl, fast (75 yards · min^{-1}), vigorous effort
8.0	Water activities	Swimming, crawl, slow (50 yards · min^{-1}), moderate or light effort
6.0	Water activities	Swimming, lake, ocean, river
6.0	Water activities	Swimming, leisurely, not lap swimming, general
8.0	Water activities	Swimming, sidestroke, general
8.0	Water activities	Swimming, synchronized
10.0	Water activities	Swimming, treading water, fast vigorous effort
4.0	Water activities	Swimming, treading water, moderate effort, general
10.0	Water activities	Water polo
3.0	Water activities	Water volleyball
5.0	Water activities	Whitewater rafting, kayaking, or canoeing
6.0	Winter activities	Moving ice house (set up/drill holes, etc.)
5.5	Winter activities	Skating, ice, 9 mph or less
7.0	Winter activities	Skating, ice, general
9.0	Winter activities	Skating, ice, rapidly, more than 9 mph
15.0	Winter activities	Skating, speed, competitive
7.0	Winter activities	Ski jumping (climb up carrying skis)
7.0	Winter activities	Skiing, general
7.0	Winter activities	Skiing, cross-country, 2.5 mph, slow or light effort, ski walking
8.0	Winter activities	Skiing, cross-country, 4.0–4.9 mph, moderate speed and effort, general
9.0	Winter activities	Skiing, cross-country, 5.0–7.9 mph, brisk speed, vigorous effort
14.0	Winter activities	Skiing, cross-country, >8.0 mph, racing
16.5	Winter activities	Skiing, cross-country, hard snow, uphill, maximum
5.0	Winter activities	Skiing, downhill, light effort
6.0	Winter activities	Skiing, downhill, moderate effort, general
8.0	Winter activities	Skiing, downhill, vigorous effort, racing
7.0	Winter activities	Sledding, tobogganing, bobsledding, luge
8.0	Winter activities	Snow shoeing
3.5	Winter activities	Snowmobiling

Additional Values

2.0	Home activities (weaving at loom, sitting)
1.8	Music playing (accordion)
6.0	Occupation: lifting 22 lb 1 m
8.0	Occupation: lifting 45 lb 1 m
11.0	Occupation: lifting 65 lb 1 m
8.0	Walking, ice climbing
8.0	Sports: rollerskiing, 10 mph, no grade
10.0	Sports: rollerskiing, 11 mph, no grade
11.0	Sports: rollerskiing, 12 mph, no grade
12.0	Sports: rollerskiing, 9 mph, 6% grade
7.5	Sports: in-line skating, 10 mph
8.5	Sports: in-line skating, 11 mph
10.0	Sports: in-line skating, 12 mph
7.0	Water activities: underwater swimming, 1 mph
9.0	Winter activities: figure skating
14.0	Winter activities: skiing, competitive, short periods

Attachment 12

Physical Activity Contract

Official Physical Activity Contract

I_____am increasing or maintaining my physical activity to the best of my ability

I have set the following goals to help me in my effort

My long-term goal is to _____ by _____(date)

My short-term goal is to _____ by _____(date)

I will increase or maintain my daily physical activity by doing the following, specific behaviors

1. _____
2. _____
3. _____
4. _____

_____(name of sponsor) agrees to remind me of my goals for this program if I am not making progress or maintaining my fitness. Furthermore, if I need assistance or have difficulties with meeting my goals I will call for assistance as soon as possible.

_____ _____ _____

Signature Participant Date Signature Sponsor Date Investigator Date